

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES

BOARD MEETING

FEBRUARY 4, 1999

**BILL A. BUSBICE, JR.
CHAIRMAN**

BATON ROUGE, LOUISIANA

The following constitute minutes of the Commission Meeting
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Louisiana Department of Wildlife and Fisheries
2000 Quail Drive

Baton Rouge, Louisiana 70808
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AGENDA
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
BATON ROUGE, LOUISIANA
FEBRUARY 4, 1999

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MINUTES OF THE MEETING
OF
LOUISIANA WILDLIFE AND FISHERIES COMMISSION

Thursday, February 4, 1999

Chairman Bill Busbice presiding.

Tom Gattle
Danny Babin
Tom Kelly
Norman McCall
Jerald Hanchey
Glynn Carver

Secretary James Jenkins, Jr. was also present.

Chairman Busbice called for a motion for approval of the **January 7, 1999 Commission Minutes**. A motion for approval was made by Commissioner Babin and seconded by Commissioner Kelly. The motion passed with no opposition.

Conservation Reinvestment Act Resolution began with Mr. Phil Bowman reminding the Commission they passed a resolution in 1997 supporting Teaming with Wildlife. Since 1997, a lot of changes has occurred, now the initiative is referred to as the OCS initiative. This would take a portion of the revenues generated from oil, gas and mineral development on the outer continental shelf and divide it between the states and federal government. Such a precedent already occurs on federal lands where monies derived from oil, gas and mineral development are currently split with the states. Mr. Bowman then read the resolution. Senators Landrieu and Breaux as well as Congressmen Tauzin, Baker, John and Jefferson are helping push this Legislation, stated Mr. Bowman. The three titles for the bill, as currently drafted, are Title 1 - impact assistance for coastal restoration projects portion of the bill which can result in \$347 million a year. Title 2 would have \$5.8 million allocated for the Land and Water Conservation fund. Title 3, known as Teaming with Wildlife, would receive \$5.4 million and a portion of these funds would come to the Department for enhancement of game, nongame and enforcement programs. Mr. Bowman then requested adoption of the Resolution by the Commission. Commissioner Gattle asked what was the allocation of Title 1? Chairman Busbice asked who will handle those funds? Mr. Bowman stated the Department of Natural Resources is the state agency that leads coastal restoration activities. Commissioner Babin made a motion to accept the Resolution and it was seconded by Commissioner Kelly. The motion passed with no opposition.

(The full text of the Resolution is made a part of the record.)

RESOLUTION IN SUPPORT OF TWW/OCS INITIATIVES IN CONGRESS

- WHEREAS,** legislation referred to as the Conservation and Reinvestment Act of 1998, was introduced in the 105th Congress, which proposed to direct offshore oil and gas revenues to certain states for coastal impact assistance, land based outdoor recreation and wildlife conservation programs; and
- WHEREAS,** similar legislation was recently reintroduced in the Senate as Senate Bill 25, known as the Conservation and Reinvestment Act of 1999; and
- WHEREAS,** these funds would come from revenues generated nationally from oil, gas, and mineral development in the federal waters of the outer continental shelf (OCS); and
- WHEREAS,** 50% of the revenue from mineral development on federal lands is currently shared with states, while revenue from mineral development in federal waters is not; and
- WHEREAS,** this proposed legislation would allocate a certain percentage of OCS revenues to coastal states based on their shoreline miles, coastal population and offshore oil and gas production; and
- WHEREAS,** Louisiana's share of such OCS funds could be more than \$350 million annually; and
- WHEREAS,** the proposed legislation would allocate a percentage of OCS revenues for wildlife programs; and
- WHEREAS,** the proposed legislation would provide a long-term source of revenues to support enhancements to existing wildlife (nongame, game, and enforcement) programs in the Department of Wildlife and Fisheries; and
- WHEREAS,** more than 80% of Louisiana's vertebrate species are nongame, and population declines in certain species of birds have been documented in Louisiana; and
- WHEREAS,** these funds are sorely needed for coastal impact assistance, to help satisfy public demand for wildlife and outdoor recreation programs and facilities statewide, and to provide other related economic, social, and environmental benefits to the people of Louisiana; and

WHEREAS, the Louisiana Congressional delegation has played an instrumental role in developing such national legislation;

THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission applauds the Louisiana Congressional delegation for its leadership in introducing this landmark legislation, and further urges and requests its continued support for its reintroduction in the House and passage in the 106th Congress.

BE IT FURTHER RESOLVED, that specific language be added to Senate Bill No. 25 of the 106th Congress conforming the percentage of funding allocated for wildlife conservation and management programs to not less than 10 percent, which will match that proposed in House Bill No. 4717 of the 105th Congress.

BE IT FURTHER RESOLVED, that the Louisiana Wildlife and Fisheries Commission supports in full the proposal of sharing with the states a level of not less than 50% of the revenues derived from federal oil and gas development on the OCS, and being distributed to all coastal states pursuant to the formula recommended by the OCS Policy Committee to the Department of Interior in October, 1997.

BE IT FURTHER RESOLVED, that any uncommitted members of Congress are hereby respectfully urged and requested to sign onto the appropriate legislative instrument.

BE IT FURTHER RESOLVED, that a copy of this resolution be sent to Senator Frank Murkowski, Chairman of the Senate Energy and Natural Resources Committee, and Congressman Don Young, Chairman of the House Resources Committee, and Louisiana's Congressional delegation.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves was presented by Mr. Dave Moreland. This Declaration of Emergency will establish seasons and regulations for farm raised white-tailed deer and exotics. The original Declaration will expire on February 28, 1999. The season on exotics is year round and to continue the regulations, Mr. Moreland asked the Commission to adopt the Resolution and Declaration of Emergency. He first noted two minor changes, the first being changing the years on the hunting dates to reflect the upcoming hunting season. These dates will be included in the hunting season packets to be adopted in July, stated Mr.

Moreland. The second change was in the language for farmers enrolling in the DMAP program. Mr. Moreland then read the Therefore Be It Resolved portion of the Resolution. Chairman Busbice asked if the season dates will fall within the criteria established? Commissioner Babin asked if the farmers were not allowed to enroll into the DMAP program? Mr. Moreland stated the Department's staff was working on developing a new program of issuing tags instead of having these farms enrolled in the DMAP program. Commissioner Gattle asked if the only difference in these hunting preserves is the extension of the dates and that the hunter has to have a license and conform to the basic rules for hunting? Mr. Moreland answered yes. Then Commissioner Gattle asked if a managed environment was including a managed program. Mr. Moreland stated this new program will allow the farmers the opportunity to harvest does every day. Commissioner Babin asked, with the development of a new program, the Declaration of Emergency will change and require action again? Mr. Moreland stated the new program would provide doe tags for the farmers, forest stewardship cooperators and farmers having deer depredation problems. Commissioner Carver asked if a time has been set for completion of this new program? Mr. Moreland stated Mr. Larry Savage was working on the program and hoped the Commission could have something to look at within the next couple of months. Chairman Busbice asked if the farmers are cooperating with the Department? Commissioner Gattle asked if any staff member has been on any farms to check their activities? Major Brian Spillman stated agents have been on two DMAP sites within the last few weeks and no problems have occurred. Commissioner Gattle then made a motion to accept the Resolution. Commissioner Carver seconded the motion and it passed with no opposition.

(The full text of the Resolution and Declaration of Emergency is made a part of the record.)

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 4, 1999

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission Meeting held in Baton Rouge, LA, February 4, 1999.

WHEREAS, the Louisiana Department of Agriculture and Forestry has been given certain authority to regulate farm-raised white-tailed deer, elk, exotic deer and antelope, raised for commercial purposes, and

WHEREAS, the Louisiana Department of Agriculture and Forestry (LDAF) developed rules pertaining to farm-raised white-tailed deer, elk, exotic deer and antelope, and

WHEREAS, these rules allowed for the raising, propagation, and hunting of imported exotic deer and antelope, elk, and farm-raised white-tailed deer within the confines of pens specified by LDAF rules and regulations,

WHEREAS, a dispute arose over the regulation of hunting and the capture of wild white-tailed deer within LDAF licensed deer farms, and

WHEREAS, the Louisiana Department of Wildlife and Fisheries and Louisiana Wildlife and Fisheries Commission filed a petition for a Temporary Restraining Order, Injunctive Relief, and Declaratory Judgement in the 19th JDC to resolve the disputed issues, and

WHEREAS, a Stipulated Judgement was rendered in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th JDC, and

WHEREAS, the Stipulated Judgement set terms for the regulation of hunting and

WHEREAS, the authority to establish hunting seasons is vested with the Louisiana Wildlife and Fisheries Commission exclusively, and

THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission adopts the attached Declaration of Emergency to establish hunting seasons and regulations for white-tailed deer, elk, exotic deer and antelope on Supplemented Hunting Preserves.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) of the Administrative Procedure Act, and under Authority of Louisiana Constitution, Article IX, Section 7, R.S. 36:601 et seq., R.S. 56:115, R.S. 56:171 et seq. and R.S. 56:651 et seq., the Wildlife and Fisheries Commission adopts the following Emergency Rule.

This Declaration of Emergency is necessary to implement portions of the written stipulations entered into on August 10, 1998, in the matter entitled Jenkins et al. v. Odom et al., No.

449244, 19th Judicial District Court, and further to provide for regulation of hunting of white-tailed deer and exotics on Supplemented Hunting Preserves. This Declaration of Emergency will govern the regulation of hunting on Supplemented Hunting Preserves until the ratification of permanent rules.

Supplemented Hunting Preserves: Hunting Seasons and Deer Management Assistance Program Participation

A. Definitions

Exotics: For purposes of this rule means any animal of the family Bovidae (except the Tribe Bovini [cattle]) or Cervidae which is not indigenous to Louisiana and which is confined on a Supplemented Hunting Preserve. Exotics shall include, but are not limited to, fallow deer, red deer, elk, sika deer, axis deer, and black buck antelope.

Hunting: In its different tenses and for purposes of this rule means to take or attempt to take, in accordance with R.S. 56:8.

Same as Outside: For purposes of this rule means hunting on a Supplemented Hunting Preserve must conform to applicable statutes and rules governing hunting and deer hunting, as provided for in Title 56 of the Louisiana Revised Statutes and as established annually by the Wildlife and Fisheries Commission (LWFC).

Supplemented Hunting Preserve: For purposes of this rule means any enclosure for which a current Farm-Raising License has been issued by the Department of Agriculture and Forestry (LDAF) with concurrence of the Department of Wildlife and Fisheries (LDWF) and is authorized in writing by the LDAF and LDWF to permit hunting.

White-tailed Deer: For purposes of this rule means any animal of the species Odocoileus virginianus which is confined on a Supplemented Hunting Preserve.

B. Hunting Seasons

1. **White-tailed Deer:** All hunting seasons for farm-raised white-tailed deer are still hunt only.

a. **Archery:** October 1, 1999 - January 31, 2000, either-sex.

b. **Modern Firearms:** November 1 - December 6, 1999; December 21 - 23, 1999; and December 26, 1999 - January 31, 2000.

c. **Either-sex deer** may be taken November 1-3, December 21-23, and December 26-30, otherwise, all modern firearm dates are bucks only. (Either-sex deer may also be taken in

accordance with provisions of the Deer Management Assistance Program).

d. Muzzleloader: December 7 - December 20, 1999, either-sex.

2. Exotics: Year round.

C. Methods of Take

1. White-tailed Deer: Same as outside.

2. Exotics: Exotics may be taken with longbow (including compound bow) and arrow; shotguns not larger than 10 gauge, loaded with buckshot or rifled slug; handguns and rifles no smaller than .22 caliber centerfire; or muzzleloading rifles or pistols, .44 caliber minimum, or shotguns 10 gauge or smaller, all of which must load exclusively from the muzzle or cap and ball cylinder, using black powder or an approved substitute only, and using ball or bullet projectile, including sabot bullets only.

D. Shooting Hours

1. White-tailed Deer: Same as outside.

2. Exotics: one-half hour before sunrise to one-half hour after sunset.

E. Bag Limit

1. Farm-Raised White-tailed Deer: Same as outside.

2. Exotics: No limit.

F. Hunting Licenses

1. White-tailed Deer: Same as outside.

2. Exotics: No person shall hunt any exotic without possessing a valid basic and big game hunting license.

G. Tagging. White-tailed Deer and Exotics: Each animal shall be tagged in the left ear or left antler immediately upon being killed and before being moved from the site of the kill with a tag provided by the LDAF. The tag shall remain with the carcass at all times.

H. Deer Management Assistance Program. Supplemented Hunting Preserves may be eligible to participate in the Deer Management Assistance Program (DMAP) in accordance with the DMAP rules.

I. Additional Restrictions. Except as otherwise specified herein, all of the provisions of Title 56 of the Louisiana Revised Statutes and the LWFC rules pertaining to the hunting and possession of white-tailed deer shall apply to white-tailed deer and exotics located on Supplemented Hunting Preserves.

J. Effective Date. This Declaration of Emergency shall become effective on February 28, 1999, and supplant any prior Declaration of Emergency pertaining to hunting of farm-raised deer and exotics.

Bill A. Busbice, Jr.
Chairman

Before Mr. Harry Blanchet presented the next agenda item, **Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum**, Chairman Busbice expressed the Commission's appreciation for the job Mr. Blanchet has done along with his leadership abilities. Mr. Blanchet then reminded the Commission that in 1995, the Department was required to provide annual reports on biological profiles and stock assessments for four species of fish taken in Louisiana waters. This year's reports include two biological profiles with new information; whereas, the other two from 1998 still contains the most current biological information on the species. A summary sheet was included and would be attached to the stock assessments to show the important facts on each species. The sheepshead is one of the species with no new biological information. A graph showed the recreational and commercial harvests for sheepshead over the last 15 years. At the lowest estimate of natural mortality, estimates of spawning potential ratio fell between 40 and 50 percent and yield per recruit was between 76 and 86 percent. If you use a higher mortality rate ($M=0.3$), then the spawning potential ratio would be 58 to 71 percent and yield per recruit would be 47 to 66 percent. Then Mr. Blanchet stated there was no new biological information for southern flounder. A similar graph was included on harvest over the last several years. A range of values for natural mortality was between 0.5 and 0.8. Spawning potential ratio for the lowest mortality was 27 to 28 percent and yield per recruit was 93 to 94 percent. On the high end of the natural mortality rate, the spawning potential ratio was 51 to 52 percent and the yield per recruit was between 65 to 67 percent. Chairman Busbice asked if there was a reason for a decline in the harvest of southern flounder? Mr. Blanchet stated regulations were implemented which included trip limits on commercial fishermen and creel limits on recreational fishermen. Commissioner McCall asked what is the normal life of a flounder? Mr. Blanchet stated the oldest flounder caught was a 7 year old. The oldest male flounder found was a 4 year old fish. Chairman Busbice asked if these results were discussed with other states to see if their numbers are the same? Mr. Blanchet stated Louisiana has only the southern flounder whereas other states have a couple of very closely related

species. Chairman Busbice then asked if the ban on gill nets had an impact on the flounder? Mr. Blanchet stated it would depend on what was causing the population increase.

Moving along, Mr. Blanchet stated the striped mullet had small differences from last year which showed up in the changes on estimates for spawning potential ratio and yield per recruit. The staff is using an age length key to get a better handle on what is being harvested and where it was being harvested. This assessment looks at stocks mainly harvested east of 90° longitude which is east of the Mississippi River. At the lowest estimate of mortality, you have 31.2 percent spawning potential ratio and 60.9 percent for the highest range of mortality. Commissioner Gattle stated the commercial harvest has been down in 1996 and 1997 and the SPR is lower, was the reason for the variance due to the location of the samples taken? Mr. Blanchet stated it was due to the technique used which included location. The last species discussed was the black drum. Mr. Blanchet stated the black drum was unique in several ways. One such way was the peak in harvest for black drum occurred before 1995 when new regulations were imposed on the fishery. Spawning potential ratio and yield per recruit at the lowest natural mortality rate was 42 percent and 92 percent, respectively. At the highest mortality rate, spawning potential ratio was 67 percent and yield per recruit was 45 percent. Also included in the packets were three letters of comment received to date. Any additional comments received will be sent in the packets for the Natural Resources Committees.

Commissioner Carver asked how long will the Stock Assessments continue? Mr. Don Puckett stated it was a continuing report until the law changes. Commissioner Babin asked if the 1995 legislation included speckled trout and redfish as well as the other four species? Mr. Blanchet stated there was a separate piece of legislation that required a report on red drum and another legislative resolution that required a report on spotted seatrout. In the 1995 legislation, these were the only four species listed in the statute. Stock assessments and profiles are maintained on the speckled trout and red drum as part of fishery management. The profile on the spotted seatrout was redone in 1997 and a report on the red drum stock assessment was also provided in 1997. Secretary Jenkins stated the 1995 legislation eliminated the report on the red fish. Commissioner Babin stated he was curious as a Commissioner on how healthy the speckled trout and red drum are. Hearing no further questions, Mr. Blanchet then asked for a motion to transmit the reports to the House and Senate Natural Resource Committees with the comments. Commissioner Hanchey made a motion to accept the reports. Commissioner Kelly seconded the motion and it passed with no opposition.

Consideration of Offshore Shrimp Closure was handled by Mr. Mark Schexnayder. He stated this action is the same as that taken last year to close offshore territorial waters off the Atchafalaya

Basin to protect the white shrimp being found out there. Then he asked the Commission to give the Secretary authority to close additional territorial areas if necessary and reopen areas when closures are no longer needed. The last part of the request was to give the Secretary authority to conduct a special inshore season if there are quantities of harvestable white shrimp that would not affect the brown shrimp harvest. Chairman Busbice asked Mr. Schexnayder to read the Therefore Be It Resolved portion of the Resolution. Commissioner Gattle asked if the reason for this action was because the water is warm? Mr. Schexnayder stated the water temperature is still below the threshold for shrimp growth. The shrimp found in the offshore waters flush back and forth from the bays. Commissioner Babin stated the 100 count is used to protect white shrimp and these shrimp are well over 100 per pound in that area. Then Commissioner Babin made a motion to accept the Resolution and it was seconded by Commissioner Kelly. The motion passed with no opposition.

(The full text of the Resolution and Declaration of Emergency is made a part of the record.)

RESOLUTION

1999 Offshore Shrimp Season Closure
adopted by the
Louisiana Wildlife and Fisheries Commission

- WHEREAS,** R.S. 56:497 provides the open shrimp seasons for all or part of the state waters shall be fixed by the Commission, and
- WHEREAS,** R.S. 56:497 provides the Commission shall have the authority to set special seasons for all or part of the state waters, and
- WHEREAS,** R.S. 56:498 provides the minimum legal count on white shrimp is 100 (whole shrimp) count per pound, except during the time period from October fifteenth through the third Monday in December when there shall be no count, and
- WHEREAS,** in the State's Territorial Waters, water temperatures are below 20 degrees Centigrade and the growth rate of white shrimp is therefore slow, and
- WHEREAS,** current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in a portion of the State's Territorial Waters do not average 100 count minimum size or larger and are present in significant numbers, now

THEREFORE BE IT RESOLVED, the Wildlife and Fisheries Commission does hereby order a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel Buoy Line to the eastern shore of Freshwater Bayou, at 6:01 a.m. on Monday, February 8, 1999.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

BE IT FURTHER RESOLVED, the Declaration of Emergency closing the State's Territorial Waters is attached to and made a part of this resolution.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) and R.S. 49:967 of the Administrative Procedure Act which allows the Wildlife and Fisheries Commission to use emergency procedures to set shrimp seasons, and R.S. 56:497 which provides that the Wildlife and Fisheries Commission shall have the authority to open or close the State's offshore waters to shrimping, the Wildlife and Fisheries Commission hereby orders a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel buoy line to the eastern shore of Freshwater Bayou. This closure is effective at 6:01 a.m., Monday, February 8, 1999.

R.S. 56:498 provides that the minimum legal count on white shrimp is 100 (whole shrimp) count per pound after the third Monday in December. Current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in this portion of the State's outside waters do not average 100 count minimum legal size or larger and are present in significant numbers. This action is being taken to protect these small white shrimp and allow them the opportunity to grow to a more valuable size.

The Wildlife and Fisheries Commission authorizes the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary; and hereby authorizes the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

Bill A. Busbice, Jr.
Chairman

Declaration of Emergency - Oyster Season in Bay Junop was the next item to be handled by Mr. Ron Dugas. Mr. Dugas asked the Commission to consider extending the oyster season in Bay Junop located in Terrebonne Parish. This bay is approximately 4,000 acres and generally produces around 70,000 sacks. The season was originally set from September 9, 1998 to April 1, 1999. This year, in excess of three-fourths of the lake has been closed due to pollution problems, only allowing the harvesting of 25,000 sacks. After discussing closures with the Department of Health, it appears the bay may be open during the month of May. Mr. Dugas then asked the Commission to extend the season until May 15, 1999. Commissioner Carver asked if the oysters really needed to be taken from the area? Mr. Dugas stated it was important for 2 reasons, the first to allow them to be put on the market and secondly from an enforcement standpoint. Chairman Busbice asked Mr. Dugas to read the Therefore Be It Resolved portion of the Resolution. Commissioner Kelly made a motion to accept the Resolution. Commissioner Hanchey seconded the motion and it passed with no opposition.

Commissioner Babin stated there is new testing occurring on oysters. The vibrio virus has cut down the consumption of oysters taken in the State of Louisiana. It has been found that if you put oysters under 50,000 pounds of pressure in water, it kills the virus and also shucks the oyster. Commissioner Babin felt this was good news for the oyster industry. Mr. Dugas stated it was very encouraging for people to be looking at new ways to solve this problem. Commissioner Kelly stated he has had an opportunity to

eat bacteria-free oysters recently and noted the taste and quality were both outstanding.

(The full text of the Resolution and Declaration of Emergency is made a part of the record.)

RESOLUTION

Bay Junop Oyster Seed Reservation Season Extension
February 4, 1999
Louisiana Wildlife and Fisheries Commission
Louisiana Department of Wildlife and Fisheries

WHEREAS, the Louisiana Wildlife and Fisheries Commission set the 1998/1999 oyster season to run from September 9, 1998 to April 1, 1999 at its August 1998 meeting with the exception of Calcasieu Oyster Tong Area, and

WHEREAS, R.S. 56:433 B(1) allows for Commission consideration of an extension to May 15th of the oyster season, and

WHEREAS, virtually all of the Bay Junop Oyster Seed Reservation was closed by the State Health Department during the 1998/1999 oyster season, and

WHEREAS, the Health Department has indicated that the entire Bay Junop Oyster Seed Reservation will meet the harvesting criteria in May.

THEREFORE BE IT RESOLVED, the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999, and

BE IT FURTHER RESOLVED, that the remaining public oyster grounds will close as previously scheduled.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the emergency provisions of the Administrative Procedure Act, R.S. 49:953(B) and 967, and under the authority of R.S. 56:433 and R.S. 56:434, notice is hereby given that the Secretary of the Department of Wildlife and Fisheries and the Wildlife and Fisheries Commission hereby declare:

That the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999.

Bill A. Busbice, Jr.
Chairman

Mrs. Heather Finley presented the next item, **Rule Ratification - Seismic Regulations**. The final rule is the same as what was adopted by the Commission as a Notice of Intent at the October Meeting, began Mrs. Finley. There were no public comments received and the legislative oversight committees elected not to hold a meeting on the proposed rule. She then asked the Commission to approve the final Rule. Commissioner Gattle made a motion to accept the Seismic Regulations as presented. Commissioner Kelly seconded the motion and it passed unanimously.

(The full text of the Rule is made a part of the record.)

RULE

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

The Wildlife and Fisheries Commission does hereby amend LAC 76:I.301 regulating seismic exploration and repeal LAC 76:I.303 on permits. Authority for adoption of this Rule is included in R.S. 30:214 and R.S. 36:609. This notice is given pursuant to the Administrative Procedure Act, R.S. 49:950 et seq.

Title 76

WILDLIFE AND FISHERIES

Part I. Wildlife and Fisheries Commission and Agencies Thereunder

Chapter 3. Special Powers and Duties

Subchapter A. Seismic Exploration

§301. Regulations

A. Definitions

Cultivation--any human activity the purpose of which is to enhance the production of oysters.

Oyster Areas--those areas of coastal Louisiana which are capable of supporting natural or cultivated oyster populations.

Oyster Bed--an oyster reef or a waterbottom on which oysters are actively being cultivated.

Oyster Reef--a discrete, clearly distinguishable structure which:

1. has been formed primarily by living oysters and other organisms;
2. is not necessarily currently supporting live oysters;
3. at least a portion of which must be above the mud line, (i.e. not covered by mud or silt); and
4. may support live oysters as a result of normal hydrological fluctuations.

B. In order to protect, conserve, and replenish the wildlife of the state of Louisiana, including all aquatic life, and pursuant to the authority conferred by Article IX, Section 7 of the Louisiana Constitution of 1974, R.S. 30:214 et seq. and R.S. 36:609; the following rules shall from and after promulgation date, govern any exploration work involving the discharge of explosives and other energy sources in the state of Louisiana for geophysical exploration.

1. The Wildlife and Fisheries Commission, pursuant to its constitutional and statutory authority, hereby designates how geophysical exploration work shall be conducted insofar as it relates to the fish, seafood, aquatic life, oysters, wildlife and waterbottoms of the state. No geophysical exploration work shall commence without the approval of the Secretary of the Department or his designee. The Department of Wildlife and Fisheries, Marine Fisheries Division, Seismic Section is hereby authorized and directed to enforce and administer these regulations with full power and authority to take all appropriate actions to ensure proper administration and compliance.

2. Application(s) for permission to operate shall be made by letter giving the names of the parishes where the geophysical exploration is to be conducted. Written permission to operate shall be valid for a period of one year from date of approval, unless otherwise specified. In order to obtain and maintain permission to operate, an applicant shall furnish the Department a surety bond in the amount of \$75,000 from a bonding company licensed to do business in the state of Louisiana and to whom A.M. Best and Company has given an "B+/7" or better rating. Bond forms may be obtained from the Seismic Section. The bond shall be filed by the applicant prior to issuance of any permission to operate. Said bond shall guarantee payment of all shot hole fees and mileage fees, inspector fees, all compensation for damage

to public lands, and waterbottoms (including, without limitation, damages for failure to remove equipment and trash), oysters, fish and other aquatic life, and/or other natural resources, man-made canals, bulkheads, rights-of-way and structures for which said applicant may be legally liable, and which may be suffered by the state of Louisiana. The bond shall also guarantee any and all fees in whole and in part for services rendered by the Department and its offices in accordance with regulations of the Department of Wildlife and Fisheries or the Wildlife and Fisheries Commission and all applicable penalties, and any other liabilities to the state of Louisiana incurred by the applicant during the geophysical operations. Applicants must also supply the Seismic Section with proof of general liability insurance in the amount of \$1,000,000. The policy must be issued by an insurer approved by the Department, and specifically cover all damage to land, waterbottoms, oysters, fish and other aquatic life, or other natural resources, man-made canals, bulkheads, rights-of-way, and other structures for which Permittee may be legally liable. In addition, Permittees applying for a renewal of the letter of permission to operate must have demonstrated a record of sound business practices by making timely payments of seismic fees to the Department, and by being in complete compliance with the Department's regulations including those regulations requiring notifications and timely submission of seismic exploration data daily reports.

3. a. The Department may, after ten working days written notice to Permittee, suspend or cancel the seismic letter of permission to operate granted pursuant hereto for failure by the Permittee, to make timely payment to the Department for obligations owed to the state of Louisiana for the following:

i. any adjusted shot hole fees and mileage fees;

ii. any compensation for damage to public lands, waterbottoms, oysters, fish and other aquatic life, or other natural resources, man-made canals, bulkheads, rights-of-way and structures for which said Permittee may be legally liable;

iii. any fees for services rendered by LDWF personnel in overseeing geophysical exploration; and

iv. any applicable penalties.

b. The Permittee shall be entitled to a hearing upon written request, made within the 10 working day notice period, to the Secretary or his designee; to review the circumstances prompting the Department to suspend or cancel his letter of permission to operate. This hearing shall be held as soon as practicable.

4. Permittees shall submit a 1:24,000 scale map showing, at a minimum, the outline of the project for comparison with Department databases of threatened, endangered, or sensitive wildlife and fisheries resources and a similar map on an 8.5" x 11" page. Permittees shall notify the Seismic Section before beginning any geophysical exploration on a "Notification of Beginning of Seismic Operations" furnished by the Seismic Section. The Permittee shall provide the Department with the names and telephone numbers of appropriate designated contact persons. The "Notification of Beginning of Seismic Operations" shall be accompanied by a map on an 8.5" x 11" page showing the outline of the project or line. The Permittee also shall furnish the Seismic Section with a certified copy of the information filed with the appropriate parish clerk of court in accordance with R.S. 30:217. The Permittee shall submit notification to the Seismic Section of interruption or cessation of work. If a change in the prospect or line is necessary, the Permittee will provide a new plat indicating the change. If a change on the prospect or line affects different properties, or leasehold interests, the Permittee will provide a new plat indicating the new prospect or line, and no work will begin until this change has been furnished to the Seismic Section and the Seismic Section has reviewed it with regard to threatened, endangered, or sensitive wildlife and fisheries resources. The granting of permission to operate does not give the Permittee the right to trespass on, or conduct activities on private properties, nor does it relieve the Permittee of the responsibility for damages to private property.

5. A Permittee shall organize a pre-project meeting with the appropriate government agencies, property owners, lessees, residents, and other interested parties in the area of the proposed project. Notice of the meeting shall be advertised in the newspapers or journals designated for legal notices in the geographic areas in which geophysical survey operations are to be conducted. Additional notices should be posted in or on appropriate public places in the area of operations. All such notices shall be issued at a reasonable time before the scheduled meeting and before commencement of geophysical operations. Maps, as provided to the Seismic Section in connection with the Notification of Beginning of Seismic Operations and information designating the Permittee's contact persons during the geophysical operations, shall be made available to the public for review at this meeting.

C. Each geophysical exploration crew working in the state of Louisiana shall always be under the supervision of the Seismic Section. A Seismic Inspector may be present during the shooting operations of the Permittee to which he or she is assigned.

1. The Seismic Section representative shall have access to all records, including without limitation, shot point location maps, and shooters' logs and tracings, but only to the extent

necessary to determine compliance with these regulations. Any and all proprietary or confidential information viewed or obtained by any Seismic Section representative or Seismic Inspector shall be maintained in strict confidence as mandated for disclosures of seismic data under R.S. 30:215. No Permittee shall be required to submit to the Department any document or thing containing such confidential, proprietary information, if such document would, thereby, become a public record.

2. The party chief or party manager shall instruct the members of his party as to the requirements of these rules and regulations, and to the duty and authority of the Seismic Section and the Seismic Inspector.

3. The party chief or party manager shall furnish the Seismic Section's representative with whatever reasonable and appropriate transportation is needed to allow him to visit the working areas and shall transport the Seismic Section's representative to whatever locations he or she requests. The Department acknowledges that, when the Permittee is providing transportation for the Seismic Inspector or other representative of the Department under these regulations or other applicable law, that the Permittee is fulfilling a state mandated function and shall not be responsible, in any way, for any decisions, instructions, actions, or omissions of such Seismic Inspector or other Department representative.

4. The Seismic Inspector has the right to suspend any particular operation (e.g., surveying, drilling, shooting, or picking up equipment) or any portion of an operation, if it violates the Seismic Section's rules and regulations.

a. Written notice of violations shall be provided to the Permittee's designated contact person as soon as practicable. Corrective action taken by the Permittee and approved by the Seismic Section should dissolve the order for suspension issued by the Seismic Inspector.

b. The Permittee may request a hearing from the Secretary or his designee to review the circumstances of any suspension of geophysical survey activities. This hearing shall be convened as soon as practicable, but in any event within ten working days after the written request for a hearing. The Department shall provide the Permittee with due notice and the opportunity to participate.

5. The Department recognizes that conflicts may arise from time to time between parties regarding access to and use of public waters, waterbottoms, public lands and natural resources. In the event that such conflicts cannot be otherwise resolved, the Department may, at the discretion of the Secretary or his designee, restrict, regulate, or suspend such potentially or actually

conflicting activities as may be necessary to provide reasonable and safe access to said public resources. The Department shall provide the Permittee's designated contact person at least five working days written notice prior to any suspension, restriction, or regulation of geophysical survey operations due to user conflicts. The Permittee may request a hearing from the Secretary or his designee to review the circumstances of the Department's restriction, regulation or suspension of geophysical activities. This hearing shall be convened as soon as practicable, but at any event within ten working days after written request for a hearing. The Department shall provide all interested parties with due notice and opportunity to participate.

6. No Seismic Inspector shall have the right to release any Permittee from the obligations imposed by these rules and regulations. Variances from these regulations may be granted by the Department only after written application by the Permittee setting forth reasons therefore. The release, signed by the Secretary or his designee, will designate the particular area and rule affected, and the procedures to be followed in lieu of any established rule. The Secretary or his designee may provide this information to appropriate interested parties upon request.

D. The Permittee must make a separate report for each day, whether or not shooting is in progress. Daily reports must furnish complete information as indicated by the report form, and must be signed by the party chief or party manager.

E. No geophysical exploration work shall be conducted on any wildlife refuge, waterfowl refuge, scenic river or stream, game preserve, fish preserve or hatchery, or oyster seed ground reservation without written permission from the Department through the division in charge of such refuge, preserve, river, stream, hatchery or reservation. While operating on any wildlife refuge, waterfowl refuge, scenic river, stream, game preserve, fish preserve or hatchery or oyster seed ground or reservation, the Permittee must abide by all rules and regulations of said area, in addition to these seismic regulations to the extent they apply.

F. Boats, marsh buggies, airboats, or other types of marsh vehicles, when used, must be used so as to cause the minimum disturbance or damage to the lands, waterbottoms, and wildlife and fisheries resources thereon. When working on wildlife management areas, wildlife refuges, scenic rivers, streams, fish preserves or hatcheries, or public oyster seed grounds or reservations, the Permittee will coordinate with the supervisor in charge of the area as to rules of the area. Rules, regulations and fees may vary from one such area to another.

G. No marsh buggies shall have contact with any oyster reef or bed, including state-owned natural reefs, nor shall any explosives or other energy sources be discharged within 250 feet of

any oyster reef or bed, including any state-owned natural reefs, without permission from the lessee of the reef or bed, and the Department. The Seismic Section will review all projects in designated public oyster seed grounds and reservations.

H. Geophysical Permittees are required to furnish an oyster lease plat to each affected oyster lessee showing the proposed number of shot points on line and their proposed location. Geophysical Permittees are required to furnish notice to oyster lease applicants of the proposed crossing of waterbottoms for which said applicant has applied for an oyster lease, provided said application(s) has been plotted on the Department's map(s).

I. All pipe used in geophysical operations must be removed to at least six feet below the surface of the ground, or six feet below the bottom in water areas, before finally leaving the shotpoint. No pipes shall be left unattended on land or in water.

J. All parties using pipe in water areas must have clearly welded or stamped at each end of each joint the name or abbreviation of the name of the Permittee using the pipe. All equipment including cables, boxes, geophones, staff poles, anchors, buoys, etc., must be permanently tagged with the name of the Permittee. All 2 x 2's used for survey lines must be clearly stamped with the name of the Permittee using the stakes at approximately three-foot intervals. These stakes must be removed immediately upon completion of the project. All cane poles must be removed immediately upon completion of the project. Anchors shall be marked, stamped, or tagged to identify the Permittee who deployed them, and shall be secured to an appropriately marked buoy, vessel, or float.

K. Permittees shall comply with the U.S. Coast Guard and/or the U.S. Army Corps of Engineers' rules and regulations for marking and lighting material and/or equipment in navigable waters. In addition, all survey buoys used in geophysical operations should be colored fluorescent green to mark receivers, and fluorescent red to mark the source line or shot line as well as show the name of the Permittee. All such floats in areas of seismic operations shall use floating line.

L. No explosives shall be discharged knowingly within 1,000 feet of a boat without notice being given to such boat so that it may move from the area.

M. Persistent gas and water discharges caused by drilling or shooting operations of seismic crews will be stopped immediately by the Permittee.

N. Explosive charges or multiple charges in the same shot hole in excess of 50 pounds shall not be used except pursuant to express written authorization from the Secretary or his designee.

Requests for the use of such charges and other variances from the charge sizes, hole depths, and/or setback requirements must be made in writing, giving the reasons why such charges are needed, the particulars of charge sizes, hole depths, patterns of deployment, and setback from potentially sensitive environments. Such requests should be addressed to the Seismic Section. Variances shall not be unreasonably withheld or delayed. All documents submitted to the Seismic Section in connection with requests for variances shall be public records; therefore, any confidential proprietary information required for review of a variance request may be submitted orally or by demonstrative presentation referenced in the written application, but the underlying confidential information shall not be disclosed in the written request filed with the Department. The Permittee may request a hearing to review all determinations, decisions, and regulations imposed with regard to requested variances, as set forth in §301.C.4.b. above. The Secretary or his designee may provide this information to appropriate interested parties upon request.

O. 1. Minimum required depth of charges shall be as follows for shots detonated in holes:

Weight of charge	Minimum required depth
1 pound or less	10 feet

Charges of 1 pound or less may only be used in upland areas. In addition, the hole must be tamped before shooting and the charge must be shot on the same day it is placed.

Between 1 pound and 2 pounds	25 feet
2 pounds up to 5 pounds	40 feet
5 pounds up to 20 pounds	60 feet
20 pounds up to 30 pounds	70 feet
30 pounds up to 40 pounds	100 feet
40 pounds up to 50 pounds	120 feet

No part of the charge shall be above minimum required depth.

2. The use of suspended charges as energy sources is prohibited unless a variance is granted by the Secretary or his designee. If permitted, the Secretary or his designee shall then set forth requirements to minimize the effect on wildlife and fisheries resources.

P. Detonation of seismic explosive charges will be allowed only during daylight hours. Variances to this rule may be requested as set forth in §301.N. Permittees shall notify the Seismic Section of 24 hour airgun operations prior to beginning such operations. The Department may, after review of the details of such night operations and areas affected thereby, impose

additional restrictions, regulations or requirements upon such operations as may be reasonable and necessary for the protection of public waters, waterbottoms, lands, and wildlife. No shooting will be allowed in heavy fog. The Permittee may request a hearing to review all determinations, decisions, and regulations imposed with regard to night operations and weather conditions, as provided for in §301.C.4.b. above.

Q. In accordance with good industry practice, Permittees shall, after drilling and loading shot holes, backfill holes with cuttings or another material authorized by the Department, and place the shot hole plug near the surface to avoid wash-in.

R. All equipment including boxes, cables, staff poles, poles, anchors, etc., must be cleared from project areas before the Permittee leaves the area. The Permittee shall confirm in writing to the Seismic Section that all its equipment, materials, and refuse have been cleared from the project area. Said letter of confirmation shall be a public record. Variances from this rule may be granted by the Department if accompanied by a written request from an affected landowner or agency. The Secretary or his designee may provide this information to appropriate interested parties upon request.

S. A fee of \$135 per day will be charged to geophysical Permittees. This fee will be reviewed each January. All payments will be made by the Permittees directly to the Department on or before the fifteenth of each month. No payments are to be made to the Seismic Inspectors. Seismic Inspectors shall make and the Seismic Section shall maintain written records of the Inspectors' work in connection with each geophysical project, identifying the date, time, location, nature of the inspector's work, and the Permittee involved.

T. Permittees making application to work on any designated oyster seed ground or reservation designated by the state of Louisiana as specified in R.S. 56:434 and 435; and LAC Title 76 will be required to pay the following fees in addition to the supervisory fees: \$100 per shot hole, or \$1,000 per linear mile, whichever is greater, for reflective or refractive cable.

Airguns Only

Water Depths	Fees (per linear mile)
Less than or equal to five feet deep	\$1,000
Greater than five feet and less than or equal to 10 feet deep	\$400
Greater than 10 feet deep	\$200

3D Airgun Surveys

Water Depths	Fees (per square mile)
Less than or equal to five feet deep	\$12,500
Greater than five feet and less than or equal to 10 feet deep	\$5,000
Greater than 10 feet deep	\$2,500

All of these fees are to be paid in advance. All fees will be reviewed each January. It is the intention of the Wildlife and Fisheries Commission and the Department to use any fees collected pursuant to this rule to plant shells for oyster cultch, to rehabilitate areas damaged by operations and as mitigation for any other damages to the coastal area.

U. All geophysical Permittees conducting operations shall exercise reasonable precaution and act in accordance with approved and accepted methods to prevent destruction of, or injury to the fish, oysters, shrimp and other aquatic life, wildlife or other living natural resources of the state of Louisiana, or their habitats.

V. Any violation of these or other rules promulgated by the Commission or the Department for the regulation of geophysical operations, or the refusal of any Permittee or its employees to comply fully with all orders and requirements which may be made by authorized personnel of the Department at the time the exploration is conducted, or any attempt to unduly influence any Seismic Inspector to abstain from the enforcement of these regulations shall constitute cause for suspension or cancellation of the "permission to operate", cessation of all exploration work, and disqualification of the party chief, party manager, field manager, and/or the Permittee involved from future operations in this state. The Permittee may request a hearing from the Secretary or his designee to review the particular circumstances prompting the Department to suspend or cancel his letter of permission to operate per the provisions of §301.C.4.b.

W. These rules and regulations supersede all other rules and regulations issued prior to this date, and are subject to change by the Department and the Wildlife and Fisheries Commission.

AUTHORITY NOTE: Promulgated in accordance with R.S. 30:214 and R.S. 36:609.

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 4:300 (August 1978), amended LR 10:410 (May 1984), LR 13:115 (February 1987), LR 18:509 (May 1992), LR 25: (February 1999).

§303. Permits

Repealed.

AUTHORITY NOTE: Promulgated in accordance with R.S. 30:214 and R.S. 36:609.

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 4:300 (August 1987), amended LR 10:410 (May 1984), repealed LR 25: (February 1999).

Bill A. Busbice, Jr.
Chairman

Mr. James Patton began his **Presentation of the Revised Strategic Plan** by stating this is a revised plan from the original plan presented six months ago. The revised plan only replaces the first section of the first volume in the original plan. Chairman Busbice asked who at the Legislature was reading all of these plans? Mr. Patton felt one of the primary reasons for including the supporting documentation was to establish that the work was being done. The revised plan is a re-tooling of the original plan so it better states what the Department's objectives are. Strategies have been added for the Office of Management and Finance and a section has been added for the administration program in the Office of the Secretary. The Offices of Wildlife and Fisheries had many minor changes. Mr. Patton offered to review the changes at the Commissioner's convenience. He then stated this was the Commission's plan as well as the Department's. Chairman Busbice asked when was Act 1465 passed by the Legislature? Mr. Patton answered during the 1997 Regular Session and was authored by Representative Jerry Luke LeBlanc. Chairman Busbice asked how many man hours has it taken to prepare the document? Mr. Patton felt the number of hours was quite substantial. He then noted most of the time was geared around creating performance indicators. Each agency's indicators will be evaluated on the basis on how they are doing against these performance indicators. The Department has met every deadline and produced all aspects required. Mr. Patton then acknowledged and commended Mrs. Wynnette Kees in pulling the whole document together. Mr. Patton asked the Commission to adopt the revised plan. Commissioner Gattle made a motion to approve the Revised Strategic Plan as presented. Commissioner Babin seconded the motion and it was approved with no opposition.

Update on Point of Sale Contract was presented by Mr. Craig Lamendola. A contract has been approved and was accomplished with no up-front money and no increase in staff. Louisiana is the first state to devise such a method and another state has chosen to follow our lead. The system is based on a pay-as-you-go plan where the contractor gets a transaction fee for every license issued. A mail out to all the licensed agents will occur very soon and will explain the process as well as include an application form to find

out how many will want to go to automated license sales. The public will have access to a hot line as well as a link on the Department's web page for help in answering their questions. This program will be open enrollment for anyone that supplies a \$150 security deposit for a terminal, stated Mr. Lamendola. He then explained how the system will work. The license issuing agents costs will be lowered and should be a major convenience to them as well as the public and state. The next hurdle to get over is to amend the federal laws to allow each state the option of issuing an electronic temporary federal duck stamp. Mr. Lamendola stated there is still a lot of work yet to be done. Commissioner Gattle asked if the equipment would be supplied to the agents by the vendor? Mr. Lamendola stated the Department would be buying the terminals. Then Commissioner Gattle asked if there would be a database that could restrict issuing licenses to those that have not paid fines or penalties? Mr. Lamendola answered yes. Commissioner Gattle asked if this would be for non-residents and residents? Again, Mr. Lamendola answered yes. Chairman Busbice asked if the smaller businesses that do not go automated would still be able to sell licenses? Mr. Lamendola stated there would be no dual systems. Commissioner Carver asked how would the businesses portion of the money be handled and will the agents still get \$0.50 a license? Mr. Lamendola stated the agents would get \$0.50 a transaction. Commissioner Babin asked about the Sheriff's 15 percent? Chairman Busbice asked if the system has been tested to see if it works? Mr. Lamendola stated a pilot program may be implemented in July. Chairman Busbice asked who would handle the hot line, and was told it would be managed by the Department.

Changing the subject, Chairman Busbice asked Mr. Lamendola about feral hogs or wild hogs? Mr. Lamendola stated Secretary Jenkins has asked him to investigate hogs. He then added there will be a symposium in Kansas this spring. Chairman Busbice stated he just found out hog hunting within the state is a growing activity. Then he asked Mr. Puckett about releasing wild hogs onto areas where they should not be released and if there are still any parishes that have the free range law.

Secretary Jenkins stated this program has involved a lot of work and has been very difficult. He complimented Mr. Lamendola for the terrific job he has done on this new system.

The Monthly Law Enforcement Report for January was given by Major Keith LaCaze. The following numbers of citations were issued during the month of January.

Region I - Minden - 106 citations.

Region II - Monroe - 114 citations.

Region III - Alexandria - 175 citations.

Region IV - Ferriday - 181 citations.

Region V - Lake Charles - 273 citations.

Region VI - Opelousas - 166 citations.

Region VII - Baton Rouge - 134 citations.

Region VIII - New Orleans - 143 citations.

Region IX - Thibodaux - 289 citations.

SWEP - 52 citations.

Statewide Strike Force - 76 citations.

Oyster Strike Force - 26 citations.

The grand total of citations issued statewide for the month of January was 1,581.

The aviation report for January 1999 showed enforcement pilots flew three airplanes a total of 34.6 hours for enforcement and 26.8 hours for other divisions.

Commissioner Carver asked what does the citation "hunting squirrels illegal methods - rifle" mean? Major LaCaze stated the hunter was probably using a rifle larger than .22 rimfire. Major LaCaze then explained the three electronic call cases made in Lake Charles area. Commissioner Babin stated he discussed this with Major LaCaze and was reassured the offenders were habitual and knew what they were doing. Chairman Busbice stated it is still an atrocity to see so many violations written each month and that he would like to see an improvement in the sentencing for some of the violations. Then he asked if the Department has seen any improvement from the prosecution of these cases? Major LaCaze stated there has been some improvement in a lot of areas, but still there are some setbacks with individual situations.

Warning Citations Discussion began with Major Keith LaCaze providing the Commissioners with a copy of the new forms. The Enforcement Division has talked with State Police and other agencies that have a similar program and have created a policy. For Class 1 and Class 2 violations, the agents are now provided the option of issuing a warning to a person instead of a ticket where a fine is involved. Major LaCaze felt the people will like this program and it would be a good public relations and educational tool. A pilot program has begun in District 7-A for the past several weeks. Commissioner Babin asked if there was any way to determine how many citations would not have been issued last month with the new program? Major LaCaze stated the program would begin statewide March 1, 1999 and these will be tracked by the computer

system. Commissioner Babin stated the Commission would then be able to know how many cases were made with the "hard" tickets and how many warnings will be issued and seems to be a step in the right direction. Commissioner Gattle asked for someone to explain the Civil Restitution reports included in the packets. Major LaCaze stated every time citations come into the office on Mondays, each person issued a citation is checked for any prior violations. Chairman Busbice stated he has talked with several agents and asked if a lot of the tickets should be issued? Major LaCaze stated a lot of the tickets should not be issued and if a situation warrants, it gives the option of reducing the number of "hard" tickets issued.

Chairman Busbice then asked for the first Division Report, January 1999 Waterfowl Census, Numbers and Distribution. Mr. Randy Myers stated the 1998-99 waterfowl season is winding down with a statewide closure occurring on January 17, 1999. Louisiana hunters had a 60 day, 6 duck season for the second year. Unusually warm weather persisted throughout the season. Warm and dry weather occurred during the first split of the duck season and the November waterfowl survey estimated 2 million birds in the coastal marshes and Catahoula Lake which is below the average of 3.1 million ducks. A mass migration of geese and ducks occurred several days after the survey was completed. The December survey indicated an estimated 2.6 million ducks and this is also below the average of 3.5 million. Heavy rains associated with a frontal system increased the waterfowl habitat in the agricultural areas of the southwest and northeast Louisiana. The majority of the State with the exception of the coastal zone received the first frost on December 16. Prior to the January survey, several cold fronts passed through the State bringing the first killing frost into coastal Louisiana. An estimated 3.3 million ducks which was down from the previous 5 year average of 3.8 million were counted. The mid-winter goose survey indicated approximately 751,000 snow geese and 102,000 white fronted geese in the State. These numbers were down from the previous mid-winter survey which was conducted December 1997. During the same period, surveys in northeast Louisiana indicated 381,000 ducks in the vastly improved agricultural areas due to the increase in rain. Overall, geographically, duck numbers were down in southwest Louisiana primarily due to the lose of good habitat forage and Tropical Storm Francis. Large numbers of ducks were observed in the Atchafalaya Delta area and the marshes just east of Terrebonne and St. Mary Parishes. Southeast marshes held high numbers of waterfowl. The overall numbers for the Mississippi River Delta were down due to the impact of Hurricane Georges. In summation, Mr. Myers stated the unusual warm and dry weather throughout the entire season had a significant impact on the waterfowl numbers in the State.

Chairman Busbice commented he had the opportunity to hunt northeast Louisiana, south Louisiana and southwest Louisiana and was asked questions on why Pecan Island did not have any ducks. He

then asked if there was a group that could follow a duck once it arrives in Louisiana, and then moves when a cold front comes through? Mr. Robert Helm stated the Department does not have a lot of that type information, but LSU did some research on pintails 3 to 5 years ago. After two to three weeks following attaching the telemetry gear and the benefit of good rains in the Mississippi Valley, the pintails moved from southwest Louisiana to northeast Louisiana and then into Arkansas. Then the reverse would sometimes occur within the same winter season, stated Mr. Helm. Chairman Busbice requested LSU do some other studies along that same line with other species. Mr. Helm stated it is an expensive effort by tracking them with airplanes.

Then Chairman Busbice asked if there has been an increase in the number of refuges the State controls or owns for ducks and geese over the past few years? Mr. Helm stated the Refuge in Kaplan is part of a system that is maintained by the Department and the U.S. Fish and Wildlife Service and the area is very effective in attracting large numbers of birds. Some changes have occurred in the refuge system in northeast Louisiana. Chairman Busbice asked if the refuges are absolutely necessary and are they feeding the ducks? Mr. Helm stated there is a lot of hunting pressure on the waterbodies and refuges may improve hunting success. Chairman Busbice stated he mentioned this so the possibility of hunting could be established on some of the refuges. Mr. Tommy Prickett stated the staff has made a conscious effort not to hide ducks on the refuges.

The 1998-99 Waterfowl Hunting Season Results began with Mr. Robert Helm stating Tropical Storm Francis had a big effect on hunting success this year. This storm ruined the September teal season and the saltwater scald caused the grass to have a winter effect. The same thing occurred when Hurricane Georges came through in southeast Louisiana. Johnson Bayou area was relatively good, but Sabine Refuge fell from harvesting 10,000 birds last year to 7,000 this year. Grand Chenier and Pecan Island had a very poor season. Terrebonne and St. Mary Parishes had big numbers of birds and some hunters mentioned this was the best season they have had in the last 15 years. The first split in southeast Louisiana was excellent but the second split was equally bad with low tides and very few new birds. Catahoula Lake experienced large amounts of rainfall with each season opening and thus a very poor season, commented Mr. Helm. However the agricultural fields in the area had a good season. North Louisiana hunters experienced a spotty season. Overall, the season was disappointing and below average, concluded Mr. Helm. Chairman Busbice stated there were a lot of coots before Christmas and then after that, there were none.

Mr. Robert Helm then reported on the **Special Snow Goose Hunting Season Regulations**. He reminded the Commissioners a proposed rule was presented to them at the December Meeting addressing the overabundance of snow geese. The approved

regulations would have allowed the use of unplugged guns and electronic calls and then eliminated a bag limit and extended the shooting hours only if the U.S. Fish and Wildlife Service agreed to these regulations. The deadline has passed and still no action from the U.S. Fish and Wildlife Service and it was not known when action would occur. The bureaucratic process of government in Washington, DC on this issue was moving very slowly. Chairman Busbice asked if the Commission should take any action? Mr. Helm stated Secretary Jenkins has contacted Louisiana's Congressional Delegates on this matter and they are watching it very closely. The effective date just keeps moving back. Commissioner Gattle asked if there was any indication of when action may occur?

Commissioner Gattle asked Ms. Nancy Hunter to explain the Civil Restitution reports included in their packets. Ms. Hunter stated the first page was a recap of monthly activities on the number of cases assessed, the amounts they were assessed, credit for the sale of any confiscated commodities, the numbers of cases paid and the amount collected. Commissioner Gattle asked how long do offenders have to pay to take advantage of a discount? Ms. Hunter answered 30 days from the date of the original invoice. Discussion continued between Commissioner Gattle and Ms. Hunter on Civil Restitution. Commissioner Babin asked Ms. Hunter, with an outstanding debt of \$1.5 million, how old are the debts and how collectible are they? Ms. Hunter stated over \$1 million is over a year old. Then Commissioner Babin asked if a fine is still owed, can that person be denied a license? Mr. Lamendola stated a flag could be placed on the licensee, but the age of it may be a problem. Secretary Jenkins stated this is a historical problem and the root of the problem is the ability, way and cost to collect the fines. Mr. Don Puckett stated the Division of Administration has finally approved a contract for a Collections Attorney and expects to have work generated towards collections. He then added that point of sale will hopefully be a valuable tool in mandating payment of fines. Commissioner McCall asked if a person can be denied a license or permit because he has not paid a fine? Mr. Puckett stated the statutes provides that non-payment of fines can result in forfeiture of hunting and fishing licenses and privileges. Commissioner Gattle stated he was glad to see the Department moving in the right direction.

After several minutes of discussion, the Commissioners agreed to hold the ~~June 1999~~ Meeting on Thursday, June 3, 1999 beginning at 10:00 a.m. at the Baton Rouge Headquarters.

Chairman Busbice then asked if there were any Public Comments. Mr. Phil Bowman stated the staff from the Office of Wildlife and the Enforcement Division have been working on developing a hunting regulations package for 1999-2000. This year there will be a series of public hearings on the hunting seasons and regulations held throughout the State. The schedule includes Ruston on March 9, then Alexandria on March 15, Lake Charles on March 16 and New

Orleans on March 18, 1999 all beginning at 7:00 PM and concluding by 10:00 PM.

Commissioner McCall asked how much damage did Rockefeller Refuge receive from the storm last summer? Mr. Bowman stated damage totaled in excess of \$1 million with \$500,000 used to replace a water control structure. Habitat damage and its impacts on waterfowl was rather severe. Also fish kills occurred. Commissioner McCall asked if some of the damage has already been repaired? Mr. Bowman stated yes. Then Commissioner McCall asked if an estimate could be given on the acres of shoreline that washed away? Mr. Bowman stated approximately 50 feet of shoreline was lost just from that one storm.

There being no further business, Commissioner Babin made a motion to Adjourn the meeting and it was seconded by Commissioner Kelly.


James H. Jenkins, Jr.
Secretary

JHJ:sch

MINUTES OF THE MEETING

OF

LOUISIANA WILDLIFE AND FISHERIES COMMISSION

Thursday, February 4, 1999

Chairman Bill Busbice presiding.

Tom Gattle
Danny Babin
Tom Kelly
Norman McCall
Jerald Hanchey
Glynn Carver

Secretary James Jenkins, Jr. was also present.

Chairman Busbice called for a motion for approval of the **January 7, 1999 Commission Minutes**. A motion for approval was made by Commissioner Babin and seconded by Commissioner Kelly. The motion passed with no opposition.

Conservation Reinvestment Act Resolution began with Mr. Phil Bowman reminding the Commission they passed a resolution in 1997 supporting Teaming with Wildlife. Since 1997, a lot of changes has occurred, now the initiative is referred to as the OCS initiative. This would take a portion of the revenues generated from oil, gas and mineral development on the outer continental shelf and divide it between the states and federal government. Such a precedent already occurs on federal lands where monies derived from oil, gas and mineral development are currently split with the states. Mr. Bowman then read the resolution. Senators Landrieu and Breaux as well as Congressmen Tauzin, Baker, John and Jefferson are helping push this legislation, stated Mr. Bowman. The three titles for the bill, as currently drafted, are Title 1 - impact assistance for coastal restoration projects portion of the bill which can result in \$347 million a year. Title 2 would have \$5.8 million allocated for the Land and Water Conservation fund. Title 3, known as Teaming with Wildlife, would receive \$5.4 million and a portion of these funds would come to the Department for enhancement of game, nongame and enforcement programs. Mr. Bowman then requested adoption of the Resolution by the Commission. Commissioner Gattle asked what was the allocation of Title 1? Chairman Busbice asked who will handle those funds? Mr. Bowman stated the Department of Natural Resources is the state agency that leads coastal restoration activities. Commissioner Babin made a motion to accept the Resolution and it was seconded by Commissioner Kelly. The motion passed with no opposition.

(The full text of the Resolution is made a part of the record.)

RESOLUTION IN SUPPORT OF TWW/OCS INITIATIVES IN CONGRESS

- WHEREAS,** legislation referred to as the Conservation and Reinvestment Act of 1998, was introduced in the 105th Congress, which proposed to direct offshore oil and gas revenues to certain states for coastal impact assistance, land based outdoor recreation and wildlife conservation programs; and
- WHEREAS,** similar legislation was recently reintroduced in the Senate as Senate Bill 25, known as the Conservation and Reinvestment Act of 1999; and
- WHEREAS,** these funds would come from revenues generated nationally from oil, gas, and mineral development in the federal waters of the outer continental shelf (OCS); and
- WHEREAS,** 50% of the revenue from mineral development on federal lands is currently shared with states, while revenue from mineral development in federal waters is not; and
- WHEREAS,** this proposed legislation would allocate a certain percentage of OCS revenues to coastal states based on their shoreline miles, coastal population and offshore oil and gas production; and
- WHEREAS,** Louisiana's share of such OCS funds could be more than \$350 million annually; and
- WHEREAS,** the proposed legislation would allocate a percentage of OCS revenues for wildlife programs; and
- WHEREAS,** the proposed legislation would provide a long-term source of revenues to support enhancements to existing wildlife (nongame, game, and enforcement) programs in the Department of Wildlife and Fisheries; and
- WHEREAS,** more than 80% of Louisiana's vertebrate species are nongame, and population declines in certain species of birds have been documented in Louisiana; and
- WHEREAS,** these funds are sorely needed for coastal impact assistance, to help satisfy public demand for wildlife and outdoor recreation programs and facilities statewide, and to provide other related economic, social, and environmental benefits to the people of Louisiana; and

WHEREAS, the Louisiana Congressional delegation has played an instrumental role in developing such national legislation;

THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission applauds the Louisiana Congressional delegation for its leadership in introducing this landmark legislation, and further urges and requests its continued support for its reintroduction in the House and passage in the 106th Congress.

BE IT FURTHER RESOLVED, that specific language be added to Senate Bill No. 25 of the 106th Congress conforming the percentage of funding allocated for wildlife conservation and management programs to not less than 10 percent, which will match that proposed in House Bill No. 4717 of the 105th Congress.

BE IT FURTHER RESOLVED, that the Louisiana Wildlife and Fisheries Commission supports in full the proposal of sharing with the states a level of not less than 50% of the revenues derived from federal oil and gas development on the OCS, and being distributed to all coastal states pursuant to the formula recommended by the OCS Policy Committee to the Department of Interior in October, 1997.

BE IT FURTHER RESOLVED, that any uncommitted members of Congress are hereby respectfully urged and requested to sign onto the appropriate legislative instrument.

BE IT FURTHER RESOLVED, that a copy of this resolution be sent to Senator Frank Murkowski, Chairman of the Senate Energy and Natural Resources Committee, and Congressman Don Young, Chairman of the House Resources Committee, and Louisiana's Congressional delegation.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves was presented by Mr. Dave Moreland. This Declaration of Emergency will establish seasons and regulations for farm raised white-tailed deer and exotics. The original Declaration will expire on February 28, 1999. The season on exotics is year round and to continue the regulations, Mr. Moreland asked the Commission to adopt the Resolution and Declaration of Emergency. He first noted two minor changes, the first being changing the years on the hunting dates to reflect the upcoming hunting season. These dates will be included in the hunting season packets to be adopted in July, stated Mr.

Moreland. The second change was in the language for farmers enrolling in the DMAP program. Mr. Moreland then read the Therefore Be It Resolved portion of the Resolution. Chairman Busbice asked if the season dates will fall within the criteria established? Commissioner Babin asked if the farmers were not allowed to enroll into the DMAP program? Mr. Moreland stated the Department's staff was working on developing a new program of issuing tags instead of having these farms enrolled in the DMAP program. Commissioner Gattle asked if the only difference in these hunting preserves is the extension of the dates and that the hunter has to have a license and conform to the basic rules for hunting? Mr. Moreland answered yes. Then Commissioner Gattle asked if a managed environment was including a managed program. Mr. Moreland stated this new program will allow the farmers the opportunity to harvest does every day. Commissioner Babin asked, with the development of a new program, the Declaration of Emergency will change and require action again? Mr. Moreland stated the new program would provide doe tags for the farmers, forest stewardship cooperators and farmers having deer depredation problems. Commissioner Carver asked if a time has been set for completion of this new program? Mr. Moreland stated Mr. Larry Savage was working on the program and hoped the Commission could have something to look at within the next couple of months. Chairman Busbice asked if the farmers are cooperating with the Department? Commissioner Gattle asked if any staff member has been on any farms to check their activities? Major Brian Spillman stated agents have been on two DMAP sites within the last few weeks and no problems have occurred. Commissioner Gattle then made a motion to accept the Resolution. Commissioner Carver seconded the motion and it passed with no opposition.

(The full text of the Resolution and Declaration of Emergency is made a part of the record.)

RESOLUTION

LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 4, 1999

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission Meeting held in Baton Rouge, LA, February 4, 1999.

WHEREAS, the Louisiana Department of Agriculture and Forestry has been given certain authority to regulate farm-raised white-tailed deer, elk, exotic deer and antelope, raised for commercial purposes, and

WHEREAS, the Louisiana Department of Agriculture and Forestry (LDAF) developed rules pertaining to farm-raised white-tailed deer, elk, exotic deer and antelope, and

WHEREAS, these rules allowed for the raising, propagation, and hunting of imported exotic deer and antelope, elk, and farm-raised white-tailed deer within the confines of pens specified by LDAF rules and regulations,

WHEREAS, a dispute arose over the regulation of hunting and the capture of wild white-tailed deer within LDAF licensed deer farms, and

WHEREAS, the Louisiana Department of Wildlife and Fisheries and Louisiana Wildlife and Fisheries Commission filed a petition for a Temporary Restraining Order, Injunctive Relief, and Declaratory Judgement in the 19th JDC to resolve the disputed issues, and

WHEREAS, a Stipulated Judgement was rendered in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th JDC, and

WHEREAS, the Stipulated Judgement set terms for the regulation of hunting and

WHEREAS, the authority to establish hunting seasons is vested with the Louisiana Wildlife and Fisheries Commission exclusively, and

THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission adopts the attached Declaration of Emergency to establish hunting seasons and regulations for white-tailed deer, elk, exotic deer and antelope on Supplemented Hunting Preserves.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) of the Administrative Procedure Act, and under Authority of Louisiana Constitution, Article IX, Section 7, R.S. 36:601 et seq., R.S. 56:115, R.S. 56:171 et seq. and R.S. 56:651 et seq., the Wildlife and Fisheries Commission adopts the following Emergency Rule.

This Declaration of Emergency is necessary to implement portions of the written stipulations entered into on August 10, 1998, in the matter entitled Jenkins et al. v. Odom et al., No.

449244, 19th Judicial District Court, and further to provide for regulation of hunting of white-tailed deer and exotics on Supplemented Hunting Preserves. This Declaration of Emergency will govern the regulation of hunting on Supplemented Hunting Preserves until the ratification of permanent rules.

Supplemented Hunting Preserves: Hunting Seasons and Deer Management Assistance Program Participation

A. Definitions

Exotics: For purposes of this rule means any animal of the family Bovidae (except the Tribe Bovini [cattle]) or Cervidae which is not indigenous to Louisiana and which is confined on a Supplemented Hunting Preserve. Exotics shall include, but are not limited to, fallow deer, red deer, elk, sika deer, axis deer, and black buck antelope.

Hunting: In its different tenses and for purposes of this rule means to take or attempt to take, in accordance with R.S. 56:8.

Same as Outside: For purposes of this rule means hunting on a Supplemented Hunting Preserve must conform to applicable statutes and rules governing hunting and deer hunting, as provided for in Title 56 of the Louisiana Revised Statutes and as established annually by the Wildlife and Fisheries Commission (LWFC).

Supplemented Hunting Preserve: For purposes of this rule means any enclosure for which a current Farm-Raising License has been issued by the Department of Agriculture and Forestry (LDAF) with concurrence of the Department of Wildlife and Fisheries (LDWF) and is authorized in writing by the LDAF and LDWF to permit hunting.

White-tailed Deer: For purposes of this rule means any animal of the species Odocoileus virginianus which is confined on a Supplemented Hunting Preserve.

B. Hunting Seasons

1. **White-tailed Deer:** All hunting seasons for farm-raised white-tailed deer are still hunt only.

a. **Archery:** October 1, 1999 - January 31, 2000, either-sex.

b. **Modern Firearms:** November 1 - December 6, 1999; December 21 - 23, 1999; and December 26, 1999 - January 31, 2000.

c. **Either-sex deer** may be taken November 1-3, December 21-23, and December 26-30, otherwise, all modern firearm dates are bucks only. (Either-sex deer may also be taken in

accordance with provisions of the Deer Management Assistance Program).

d. Muzzleloader: December 7 - December 20, 1999, either-sex.

2. Exotics: Year round.

C. Methods of Take

1. White-tailed Deer: Same as outside.

2. Exotics: Exotics may be taken with longbow (including compound bow) and arrow; shotguns not larger than 10 gauge, loaded with buckshot or rifled slug; handguns and rifles no smaller than .22 caliber centerfire; or muzzleloading rifles or pistols, .44 caliber minimum, or shotguns 10 gauge or smaller, all of which must load exclusively from the muzzle or cap and ball cylinder, using black powder or an approved substitute only, and using ball or bullet projectile, including sabot bullets only.

D. Shooting Hours

1. White-tailed Deer: Same as outside.

2. Exotics: one-half hour before sunrise to one-half hour after sunset.

E. Bag Limit

1. Farm-Raised White-tailed Deer: Same as outside.

2. Exotics: No limit.

F. Hunting Licenses

1. White-tailed Deer: Same as outside.

2. Exotics: No person shall hunt any exotic without possessing a valid basic and big game hunting license.

G. Tagging. White-tailed Deer and Exotics: Each animal shall be tagged in the left ear or left antler immediately upon being killed and before being moved from the site of the kill with a tag provided by the LDAF. The tag shall remain with the carcass at all times.

H. Deer Management Assistance Program. Supplemented Hunting Preserves may be eligible to participate in the Deer Management Assistance Program (DMAP) in accordance with the DMAP rules.

I. Additional Restrictions. Except as otherwise specified herein, all of the provisions of Title 56 of the Louisiana Revised Statutes and the LWFC rules pertaining to the hunting and possession of white-tailed deer shall apply to white-tailed deer and exotics located on Supplemented Hunting Preserves.

J. Effective Date. This Declaration of Emergency shall become effective on February 28, 1999, and supplant any prior Declaration of Emergency pertaining to hunting of farm-raised deer and exotics.

Bill A. Busbice, Jr.
Chairman

Before Mr. Harry Blanchet presented the next agenda item, **Presentation of 1999 Profiles and Stock Assessments for Sheephead, Southern Flounder, Striped Mullet and Black Drum**, Chairman Busbice expressed the Commission's appreciation for the job Mr. Blanchet has done along with his leadership abilities. Mr. Blanchet then reminded the Commission that in 1995, the Department was required to provide annual reports on biological profiles and stock assessments for four species of fish taken in Louisiana waters. This year's reports include two biological profiles with new information; whereas, the other two from 1998 still contains the most current biological information on the species. A summary sheet was included and would be attached to the stock assessments to show the important facts on each species. The sheephead is one of the species with no new biological information. A graph showed the recreational and commercial harvests for sheephead over the last 15 years. At the lowest estimate of natural mortality, estimates of spawning potential ratio fell between 40 and 50 percent and yield per recruit was between 76 and 86 percent. If you use a higher mortality rate ($M=0.3$), then the spawning potential ratio would be 58 to 71 percent and yield per recruit would be 47 to 66 percent. Then Mr. Blanchet stated there was no new biological information for southern flounder. A similar graph was included on harvest over the last several years. A range of values for natural mortality was between 0.5 and 0.8. Spawning potential ratio for the lowest mortality was 27 to 28 percent and yield per recruit was 93 to 94 percent. On the high end of the natural mortality rate, the spawning potential ratio was 51 to 52 percent and the yield per recruit was between 65 to 67 percent. Chairman Busbice asked if there was a reason for a decline in the harvest of southern flounder? Mr. Blanchet stated regulations were implemented which included trip limits on commercial fishermen and creel limits on recreational fishermen. Commissioner McCall asked what is the normal life of a flounder? Mr. Blanchet stated the oldest flounder caught was a 7 year old. The oldest male flounder found was a 4 year old fish. Chairman Busbice asked if these results were discussed with other states to see if their numbers are the same? Mr. Blanchet stated Louisiana has only the southern flounder whereas other states have a couple of very closely related

species. Chairman Busbice then asked if the ban on gill nets had an impact on the flounder? Mr. Blanchet stated it would depend on what was causing the population increase.

Moving along, Mr. Blanchet stated the striped mullet had small differences from last year which showed up in the changes on estimates for spawning potential ratio and yield per recruit. The staff is using an age length key to get a better handle on what is being harvested and where it was being harvested. This assessment looks at stocks mainly harvested east of 90° longitude which is east of the Mississippi River. At the lowest estimate of mortality, you have 31.2 percent spawning potential ratio and 60.9 percent for the highest range of mortality. Commissioner Gattle stated the commercial harvest has been down in 1996 and 1997 and the SPR is lower, was the reason for the variance due to the location of the samples taken? Mr. Blanchet stated it was due to the technique used which included location. The last species discussed was the black drum. Mr. Blanchet stated the black drum was unique in several ways. One such way was the peak in harvest for black drum occurred before 1995 when new regulations were imposed on the fishery. Spawning potential ratio and yield per recruit at the lowest natural mortality rate was 42 percent and 92 percent, respectively. At the highest mortality rate, spawning potential ratio was 67 percent and yield per recruit was 45 percent. Also included in the packets were three letters of comment received to date. Any additional comments received will be sent in the packets for the Natural Resources Committees.

Commissioner Carver asked how long will the Stock Assessments continue? Mr. Don Puckett stated it was a continuing report until the law changes. Commissioner Babin asked if the 1995 legislation included speckled trout and redfish as well as the other four species? Mr. Blanchet stated there was a separate piece of legislation that required a report on red drum and another legislative resolution that required a report on spotted seatrout. In the 1995 legislation, these were the only four species listed in the statute. Stock assessments and profiles are maintained on the speckled trout and red drum as part of fishery management. The profile on the spotted seatrout was redone in 1997 and a report on the red drum stock assessment was also provided in 1997. Secretary Jenkins stated the 1995 legislation eliminated the report on the red fish. Commissioner Babin stated he was curious as a Commissioner on how healthy the speckled trout and red drum are. Hearing no further questions, Mr. Blanchet then asked for a motion to transmit the reports to the House and Senate Natural Resource Committees with the comments. Commissioner Hanchey made a motion to accept the reports. Commissioner Kelly seconded the motion and it passed with no opposition.

Consideration of Offshore Shrimp Closure was handled by Mr. Mark Schexnayder. He stated this action is the same as that taken last year to close offshore territorial waters off the Atchafalaya

Basin to protect the white shrimp being found out there. Then he asked the Commission to give the Secretary authority to close additional territorial areas if necessary and reopen areas when closures are no longer needed. The last part of the request was to give the Secretary authority to conduct a special inshore season if there are quantities of harvestable white shrimp that would not affect the brown shrimp harvest. Chairman Busbice asked Mr. Schexnayder to read the Therefore Be It Resolved portion of the Resolution. Commissioner Gattle asked if the reason for this action was because the water is warm? Mr. Schexnayder stated the water temperature is still below the threshold for shrimp growth. The shrimp found in the offshore waters flush back and forth from the bays. Commissioner Babin stated the 100 count is used to protect white shrimp and these shrimp are well over 100 per pound in that area. Then Commissioner Babin made a motion to accept the Resolution and it was seconded by Commissioner Kelly. The motion passed with no opposition.

(The full text of the Resolution and Declaration of Emergency is made a part of the record.)

RESOLUTION

1999 Offshore Shrimp Season Closure
adopted by the
Louisiana Wildlife and Fisheries Commission

- WHEREAS,** R.S. 56:497 provides the open shrimp seasons for all or part of the state waters shall be fixed by the Commission, and
- WHEREAS,** R.S. 56:497 provides the Commission shall have the authority to set special seasons for all or part of the state waters, and
- WHEREAS,** R.S. 56:498 provides the minimum legal count on white shrimp is 100 (whole shrimp) count per pound, except during the time period from October fifteenth through the third Monday in December when there shall be no count, and
- WHEREAS,** in the State's Territorial Waters, water temperatures are below 20 degrees Centigrade and the growth rate of white shrimp is therefore slow, and
- WHEREAS,** current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in a portion of the State's Territorial Waters do not average 100 count minimum size or larger and are present in significant numbers, now

THEREFORE BE IT RESOLVED, the Wildlife and Fisheries Commission does hereby order a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel Buoy Line to the eastern shore of Freshwater Bayou, at 6:01 a.m. on Monday, February 8, 1999.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

BE IT FURTHER RESOLVED, the Declaration of Emergency closing the State's Territorial Waters is attached to and made a part of this resolution.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) and R.S. 49:967 of the Administrative Procedure Act which allows the Wildlife and Fisheries Commission to use emergency procedures to set shrimp seasons, and R.S. 56:497 which provides that the Wildlife and Fisheries Commission shall have the authority to open or close the State's offshore waters to shrimping, the Wildlife and Fisheries Commission hereby orders a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel buoy line to the eastern shore of Freshwater Bayou. This closure is effective at 6:01 a.m., Monday, February 8, 1999.

R.S. 56:498 provides that the minimum legal count on white shrimp is 100 (whole shrimp) count per pound after the third Monday in December. Current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in this portion of the State's outside waters do not average 100 count minimum legal size or larger and are present in significant numbers. This action is being taken to protect these small white shrimp and allow them the opportunity to grow to a more valuable size.

The Wildlife and Fisheries Commission authorizes the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary; and hereby authorizes the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

Bill A. Busbice, Jr.
Chairman

Declaration of Emergency - Oyster Season in Bay Junop was the next item to be handled by Mr. Ron Dugas. Mr. Dugas asked the Commission to consider extending the oyster season in Bay Junop located in Terrebonne Parish. This bay is approximately 4,000 acres and generally produces around 70,000 sacks. The season was originally set from September 9, 1998 to April 1, 1999. This year, in excess of three-fourths of the lake has been closed due to pollution problems, only allowing the harvesting of 25,000 sacks. After discussing closures with the Department of Health, it appears the bay may be open during the month of May. Mr. Dugas then asked the Commission to extend the season until May 15, 1999. Commissioner Carver asked if the oysters really needed to be taken from the area? Mr. Dugas stated it was important for 2 reasons, the first to allow them to be put on the market and secondly from an enforcement standpoint. Chairman Busbice asked Mr. Dugas to read the Therefore Be It Resolved portion of the Resolution. Commissioner Kelly made a motion to accept the Resolution. Commissioner Hanchey seconded the motion and it passed with no opposition.

Commissioner Babin stated there is new testing occurring on oysters. The vibrio virus has cut down the consumption of oysters taken in the State of Louisiana. It has been found that if you put oysters under 50,000 pounds of pressure in water, it kills the virus and also shucks the oyster. Commissioner Babin felt this was good news for the oyster industry. Mr. Dugas stated it was very encouraging for people to be looking at new ways to solve this problem. Commissioner Kelly stated he has had an opportunity to

eat bacteria-free oysters recently and noted the taste and quality were both outstanding.

(The full text of the Resolution and Declaration of Emergency is made a part of the record.)

RESOLUTION

Bay Junop Oyster Seed Reservation Season Extension February 4, 1999

Louisiana Wildlife and Fisheries Commission
Louisiana Department of Wildlife and Fisheries

WHEREAS, the Louisiana Wildlife and Fisheries Commission set the 1998/1999 oyster season to run from September 9, 1998 to April 1, 1999 at its August 1998 meeting with the exception of Calcasieu Oyster Tong Area, and

WHEREAS, R.S. 56:433 B(1) allows for Commission consideration of an extension to May 15th of the oyster season, and

WHEREAS, virtually all of the Bay Junop Oyster Seed Reservation was closed by the State Health Department during the 1998/1999 oyster season, and

WHEREAS, the Health Department has indicated that the entire Bay Junop Oyster Seed Reservation will meet the harvesting criteria in May.

THEREFORE BE IT RESOLVED, the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999, and

BE IT FURTHER RESOLVED, that the remaining public oyster grounds will close as previously scheduled.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the emergency provisions of the Administrative Procedure Act, R.S. 49:953(B) and 967, and under the authority of R.S. 56:433 and R.S. 56:434, notice is hereby given that the Secretary of the Department of Wildlife and Fisheries and the Wildlife and Fisheries Commission hereby declare:

That the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999.

Bill A. Busbice, Jr.
Chairman

Mrs. Heather Finley presented the next item, **Rule Ratification - Seismic Regulations**. The final rule is the same as what was adopted by the Commission as a Notice of Intent at the October Meeting, began Mrs. Finley. There were no public comments received and the legislative oversight committees elected not to hold a meeting on the proposed rule. She then asked the Commission to approve the final Rule. Commissioner Gattle made a motion to accept the Seismic Regulations as presented. Commissioner Kelly seconded the motion and it passed unanimously.

(The full text of the Rule is made a part of the record.)

RULE

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

The Wildlife and Fisheries Commission does hereby amend LAC 76:I.301 regulating seismic exploration and repeal LAC 76:I.303 on permits. Authority for adoption of this Rule is included in R.S. 30:214 and R.S. 36:609. This notice is given pursuant to the Administrative Procedure Act, R.S. 49:950 et seq.

Title 76

WILDLIFE AND FISHERIES

Part I. Wildlife and Fisheries Commission and Agencies Thereunder

Chapter 3. Special Powers and Duties

Subchapter A. Seismic Exploration

§301. Regulations

A. Definitions

Cultivation--any human activity the purpose of which is to enhance the production of oysters.

Oyster Areas--those areas of coastal Louisiana which are capable of supporting natural or cultivated oyster populations.

Oyster Bed--an oyster reef or a waterbottom on which oysters are actively being cultivated.

Oyster Reef--a discrete, clearly distinguishable structure which:

1. has been formed primarily by living oysters and other organisms;
2. is not necessarily currently supporting live oysters;
3. at least a portion of which must be above the mud line, (i.e. not covered by mud or silt); and
4. may support live oysters as a result of normal hydrological fluctuations.

B. In order to protect, conserve, and replenish the wildlife of the state of Louisiana, including all aquatic life, and pursuant to the authority conferred by Article IX, Section 7 of the Louisiana Constitution of 1974, R.S. 30:214 et seq. and R.S. 36:609; the following rules shall from and after promulgation date, govern any exploration work involving the discharge of explosives and other energy sources in the state of Louisiana for geophysical exploration.

1. The Wildlife and Fisheries Commission, pursuant to its constitutional and statutory authority, hereby designates how geophysical exploration work shall be conducted insofar as it relates to the fish, seafood, aquatic life, oysters, wildlife and waterbottoms of the state. No geophysical exploration work shall commence without the approval of the Secretary of the Department or his designee. The Department of Wildlife and Fisheries, Marine Fisheries Division, Seismic Section is hereby authorized and directed to enforce and administer these regulations with full power and authority to take all appropriate actions to ensure proper administration and compliance.

2. Application(s) for permission to operate shall be made by letter giving the names of the parishes where the geophysical exploration is to be conducted. Written permission to operate shall be valid for a period of one year from date of approval, unless otherwise specified. In order to obtain and maintain permission to operate, an applicant shall furnish the Department a surety bond in the amount of \$75,000 from a bonding company licensed to do business in the state of Louisiana and to whom A.M. Best and Company has given an "B+/7" or better rating. Bond forms may be obtained from the Seismic Section. The bond shall be filed by the applicant prior to issuance of any permission to operate. Said bond shall guarantee payment of all shot hole fees and mileage fees, inspector fees, all compensation for damage

to public lands, and waterbottoms (including, without limitation, damages for failure to remove equipment and trash), oysters, fish and other aquatic life, and/or other natural resources, man-made canals, bulkheads, rights-of-way and structures for which said applicant may be legally liable, and which may be suffered by the state of Louisiana. The bond shall also guarantee any and all fees in whole and in part for services rendered by the Department and its offices in accordance with regulations of the Department of Wildlife and Fisheries or the Wildlife and Fisheries Commission and all applicable penalties, and any other liabilities to the state of Louisiana incurred by the applicant during the geophysical operations. Applicants must also supply the Seismic Section with proof of general liability insurance in the amount of \$1,000,000. The policy must be issued by an insurer approved by the Department, and specifically cover all damage to land, waterbottoms, oysters, fish and other aquatic life, or other natural resources, man-made canals, bulkheads, rights-of-way, and other structures for which Permittee may be legally liable. In addition, Permittees applying for a renewal of the letter of permission to operate must have demonstrated a record of sound business practices by making timely payments of seismic fees to the Department, and by being in complete compliance with the Department's regulations including those regulations requiring notifications and timely submission of seismic exploration data daily reports.

3. a. The Department may, after ten working days written notice to Permittee, suspend or cancel the seismic letter of permission to operate granted pursuant hereto for failure by the Permittee, to make timely payment to the Department for obligations owed to the state of Louisiana for the following:

i. any adjusted shot hole fees and mileage fees;

ii. any compensation for damage to public lands, waterbottoms, oysters, fish and other aquatic life, or other natural resources, man-made canals, bulkheads, rights-of-way and structures for which said Permittee may be legally liable;

iii. any fees for services rendered by LDWF personnel in overseeing geophysical exploration; and

iv. any applicable penalties.

b. The Permittee shall be entitled to a hearing upon written request, made within the 10 working day notice period, to the Secretary or his designee, to review the circumstances prompting the Department to suspend or cancel his letter of permission to operate. This hearing shall be held as soon as practicable.

4. Permittees shall submit a 1:24,000 scale map showing, at a minimum, the outline of the project for comparison with Department databases of threatened, endangered, or sensitive wildlife and fisheries resources and a similar map on an 8.5" x 11" page. Permittees shall notify the Seismic Section before beginning any geophysical exploration on a "Notification of Beginning of Seismic Operations" furnished by the Seismic Section. The Permittee shall provide the Department with the names and telephone numbers of appropriate designated contact persons. The "Notification of Beginning of Seismic Operations" shall be accompanied by a map on an 8.5" x 11" page showing the outline of the project or line. The Permittee also shall furnish the Seismic Section with a certified copy of the information filed with the appropriate parish clerk of court in accordance with R.S. 30:217. The Permittee shall submit notification to the Seismic Section of interruption or cessation of work. If a change in the prospect or line is necessary, the Permittee will provide a new plat indicating the change. If a change on the prospect or line affects different properties, or leasehold interests, the Permittee will provide a new plat indicating the new prospect or line, and no work will begin until this change has been furnished to the Seismic Section and the Seismic Section has reviewed it with regard to threatened, endangered, or sensitive wildlife and fisheries resources. The granting of permission to operate does not give the Permittee the right to trespass on, or conduct activities on private properties, nor does it relieve the Permittee of the responsibility for damages to private property.

5. A Permittee shall organize a pre-project meeting with the appropriate government agencies, property owners, lessees, residents, and other interested parties in the area of the proposed project. Notice of the meeting shall be advertised in the newspapers or journals designated for legal notices in the geographic areas in which geophysical survey operations are to be conducted. Additional notices should be posted in or on appropriate public places in the area of operations. All such notices shall be issued at a reasonable time before the scheduled meeting and before commencement of geophysical operations. Maps, as provided to the Seismic Section in connection with the Notification of Beginning of Seismic Operations and information designating the Permittee's contact persons during the geophysical operations, shall be made available to the public for review at this meeting.

C. Each geophysical exploration crew working in the state of Louisiana shall always be under the supervision of the Seismic Section. A Seismic Inspector may be present during the shooting operations of the Permittee to which he or she is assigned.

1. The Seismic Section representative shall have access to all records, including without limitation, shot point location maps, and shooters' logs and tracings, but only to the extent

necessary to determine compliance with these regulations. Any and all proprietary or confidential information viewed or obtained by any Seismic Section representative or Seismic Inspector shall be maintained in strict confidence as mandated for disclosures of seismic data under R.S. 30:215. No Permittee shall be required to submit to the Department any document or thing containing such confidential, proprietary information, if such document would, thereby, become a public record.

2. The party chief or party manager shall instruct the members of his party as to the requirements of these rules and regulations, and to the duty and authority of the Seismic Section and the Seismic Inspector.

3. The party chief or party manager shall furnish the Seismic Section's representative with whatever reasonable and appropriate transportation is needed to allow him to visit the working areas and shall transport the Seismic Section's representative to whatever locations he or she requests. The Department acknowledges that, when the Permittee is providing transportation for the Seismic Inspector or other representative of the Department under these regulations or other applicable law, that the Permittee is fulfilling a state mandated function and shall not be responsible, in any way, for any decisions, instructions, actions, or omissions of such Seismic Inspector or other Department representative.

4. The Seismic Inspector has the right to suspend any particular operation (e.g., surveying, drilling, shooting, or picking up equipment) or any portion of an operation, if it violates the Seismic Section's rules and regulations.

a. Written notice of violations shall be provided to the Permittee's designated contact person as soon as practicable. Corrective action taken by the Permittee and approved by the Seismic Section should dissolve the order for suspension issued by the Seismic Inspector.

b. The Permittee may request a hearing from the Secretary or his designee to review the circumstances of any suspension of geophysical survey activities. This hearing shall be convened as soon as practicable, but in any event within ten working days after the written request for a hearing. The Department shall provide the Permittee with due notice and the opportunity to participate.

5. The Department recognizes that conflicts may arise from time to time between parties regarding access to and use of public waters, waterbottoms, public lands and natural resources. In the event that such conflicts cannot be otherwise resolved, the Department may, at the discretion of the Secretary or his designee, restrict, regulate, or suspend such potentially or actually

conflicting activities as may be necessary to provide reasonable and safe access to said public resources. The Department shall provide the Permittee's designated contact person at least five working days written notice prior to any suspension, restriction, or regulation of geophysical survey operations due to user conflicts. The Permittee may request a hearing from the Secretary or his designee to review the circumstances of the Department's restriction, regulation or suspension of geophysical activities. This hearing shall be convened as soon as practicable, but at any event within ten working days after written request for a hearing. The Department shall provide all interested parties with due notice and opportunity to participate.

6. No Seismic Inspector shall have the right to release any Permittee from the obligations imposed by these rules and regulations. Variances from these regulations may be granted by the Department only after written application by the Permittee setting forth reasons therefore. The release, signed by the Secretary or his designee, will designate the particular area and rule affected, and the procedures to be followed in lieu of any established rule. The Secretary or his designee may provide this information to appropriate interested parties upon request.

D. The Permittee must make a separate report for each day, whether or not shooting is in progress. Daily reports must furnish complete information as indicated by the report form, and must be signed by the party chief or party manager.

E. No geophysical exploration work shall be conducted on any wildlife refuge, waterfowl refuge, scenic river or stream, game preserve, fish preserve or hatchery, or oyster seed ground reservation without written permission from the Department through the division in charge of such refuge, preserve, river, stream, hatchery or reservation. While operating on any wildlife refuge, waterfowl refuge, scenic river, stream, game preserve, fish preserve or hatchery or oyster seed ground or reservation, the Permittee must abide by all rules and regulations of said area, in addition to these seismic regulations to the extent they apply.

F. Boats, marsh buggies, airboats, or other types of marsh vehicles, when used, must be used so as to cause the minimum disturbance or damage to the lands, waterbottoms, and wildlife and fisheries resources thereon. When working on wildlife management areas, wildlife refuges, scenic rivers, streams, fish preserves or hatcheries, or public oyster seed grounds or reservations, the Permittee will coordinate with the supervisor in charge of the area as to rules of the area. Rules, regulations and fees may vary from one such area to another.

G. No marsh buggies shall have contact with any oyster reef or bed, including state-owned natural reefs, nor shall any explosives or other energy sources be discharged within 250 feet of

any oyster reef or bed, including any state-owned natural reefs, without permission from the lessee of the reef or bed, and the Department. The Seismic Section will review all projects in designated public oyster seed grounds and reservations.

H. Geophysical Permittees are required to furnish an oyster lease plat to each affected oyster lessee showing the proposed number of shot points on line and their proposed location. Geophysical Permittees are required to furnish notice to oyster lease applicants of the proposed crossing of waterbottoms for which said applicant has applied for an oyster lease, provided said application(s) has been plotted on the Department's map(s).

I. All pipe used in geophysical operations must be removed to at least six feet below the surface of the ground, or six feet below the bottom in water areas, before finally leaving the shotpoint. No pipes shall be left unattended on land or in water.

J. All parties using pipe in water areas must have clearly welded or stamped at each end of each joint the name or abbreviation of the name of the Permittee using the pipe. All equipment including cables, boxes, geophones, staff poles, anchors, buoys, etc., must be permanently tagged with the name of the Permittee. All 2 x 2's used for survey lines must be clearly stamped with the name of the Permittee using the stakes at approximately three-foot intervals. These stakes must be removed immediately upon completion of the project. All cane poles must be removed immediately upon completion of the project. Anchors shall be marked, stamped, or tagged to identify the Permittee who deployed them, and shall be secured to an appropriately marked buoy, vessel, or float.

K. Permittees shall comply with the U.S. Coast Guard and/or the U.S. Army Corps of Engineers' rules and regulations for marking and lighting material and/or equipment in navigable waters. In addition, all survey buoys used in geophysical operations should be colored fluorescent green to mark receivers, and fluorescent red to mark the source line or shot line as well as show the name of the Permittee. All such floats in areas of seismic operations shall use floating line.

L. No explosives shall be discharged knowingly within 1,000 feet of a boat without notice being given to such boat so that it may move from the area.

M. Persistent gas and water discharges caused by drilling or shooting operations of seismic crews will be stopped immediately by the Permittee.

N. Explosive charges or multiple charges in the same shot hole in excess of 50 pounds shall not be used except pursuant to express written authorization from the Secretary or his designee.

Requests for the use of such charges and other variances from the charge sizes, hole depths, and/or setback requirements must be made in writing, giving the reasons why such charges are needed, the particulars of charge sizes, hole depths, patterns of deployment, and setback from potentially sensitive environments. Such requests should be addressed to the Seismic Section. Variances shall not be unreasonably withheld or delayed. All documents submitted to the Seismic Section in connection with requests for variances shall be public records; therefore, any confidential proprietary information required for review of a variance request may be submitted orally or by demonstrative presentation referenced in the written application, but the underlying confidential information shall not be disclosed in the written request filed with the Department. The Permittee may request a hearing to review all determinations, decisions, and regulations imposed with regard to requested variances, as set forth in §301.C.4.b. above. The Secretary or his designee may provide this information to appropriate interested parties upon request.

O. 1. Minimum required depth of charges shall be as follows for shots detonated in holes:

Weight of charge	Minimum required depth
1 pound or less	10 feet

Charges of 1 pound or less may only be used in upland areas. In addition, the hole must be tamped before shooting and the charge must be shot on the same day it is placed.

Between 1 pound and 2 pounds	25 feet
2 pounds up to 5 pounds	40 feet
5 pounds up to 20 pounds	60 feet
20 pounds up to 30 pounds	70 feet
30 pounds up to 40 pounds	100 feet
40 pounds up to 50 pounds	120 feet

No part of the charge shall be above minimum required depth.

2. The use of suspended charges as energy sources is prohibited unless a variance is granted by the Secretary or his designee. If permitted, the Secretary or his designee shall then set forth requirements to minimize the effect on wildlife and fisheries resources.

P. Detonation of seismic explosive charges will be allowed only during daylight hours. Variances to this rule may be requested as set forth in §301.N. Permittees shall notify the Seismic Section of 24 hour airgun operations prior to beginning such operations. The Department may, after review of the details of such night operations and areas affected thereby, impose

additional restrictions, regulations or requirements upon such operations as may be reasonable and necessary for the protection of public waters, waterbottoms, lands, and wildlife. No shooting will be allowed in heavy fog. The Permittee may request a hearing to review all determinations, decisions, and regulations imposed with regard to night operations and weather conditions, as provided for in §301.C.4.b. above.

Q. In accordance with good industry practice, Permittee shall, after drilling and loading shot holes, backfill holes with cuttings or another material authorized by the Department, and place the shot hole plug near the surface to avoid wash-in.

R. All equipment including boxes, cables, staff poles, poles, anchors, etc., must be cleared from project areas before the Permittee leaves the area. The Permittee shall confirm in writing to the Seismic Section that all its equipment, materials, and refuse have been cleared from the project area. Said letter of confirmation shall be a public record. Variances from this rule may be granted by the Department if accompanied by a written request from an affected landowner or agency. The Secretary or his designee may provide this information to appropriate interested parties upon request.

S. A fee of \$135 per day will be charged to geophysical Permittees. This fee will be reviewed each January. All payments will be made by the Permittees directly to the Department on or before the fifteenth of each month. No payments are to be made to the Seismic Inspectors. Seismic Inspectors shall make and the Seismic Section shall maintain written records of the Inspectors' work in connection with each geophysical project, identifying the date, time, location, nature of the inspector's work, and the Permittee involved.

T. Permittees making application to work on any designated oyster seed ground or reservation designated by the state of Louisiana as specified in R.S. 56:434 and 435; and IAC Title 76 will be required to pay the following fees in addition to the supervisory fees: \$100 per shot hole, or \$1,000 per linear mile, whichever is greater, for reflective or refractive cable.

Airguns Only

Water Depths	Fees (per linear mile)
Less than or equal to five feet deep	\$1,000
Greater than five feet and less than or equal to 10 feet deep	\$400
Greater than 10 feet deep	\$200

3D Airgun Surveys

Water Depths	Fees (per square mile)
Less than or equal to five feet deep	\$12,500
Greater than five feet and less than or equal to 10 feet deep	\$5,000
Greater than 10 feet deep	\$2,500

All of these fees are to be paid in advance. All fees will be reviewed each January. It is the intention of the Wildlife and Fisheries Commission and the Department to use any fees collected pursuant to this rule to plant shells for oyster cultch, to rehabilitate areas damaged by operations and as mitigation for any other damages to the coastal area.

U. All geophysical Permittees conducting operations shall exercise reasonable precaution and act in accordance with approved and accepted methods to prevent destruction of, or injury to the fish, oysters, shrimp and other aquatic life, wildlife or other living natural resources of the state of Louisiana, or their habitats.

V. Any violation of these or other rules promulgated by the Commission or the Department for the regulation of geophysical operations, or the refusal of any Permittee or its employees to comply fully with all orders and requirements which may be made by authorized personnel of the Department at the time the exploration is conducted, or any attempt to unduly influence any Seismic Inspector to abstain from the enforcement of these regulations shall constitute cause for suspension or cancellation of the "permission to operate", cessation of all exploration work, and disqualification of the party chief, party manager, field manager, and/or the Permittee involved from future operations in this state. The Permittee may request a hearing from the Secretary or his designee to review the particular circumstances prompting the Department to suspend or cancel his letter of permission to operate per the provisions of §301.C.4.b.

W. These rules and regulations supersede all other rules and regulations issued prior to this date, and are subject to change by the Department and the Wildlife and Fisheries Commission.

AUTHORITY NOTE: Promulgated in accordance with R.S. 30:214 and R.S. 36:609.

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 4:300 (August 1978), amended LR 10:410 (May 1984), LR 13:115 (February 1987), LR 18:509 (May 1992), LR 25: (February 1999).

§303. Permits

Repealed.

AUTHORITY NOTE: Promulgated in accordance with R.S. 30:214 and R.S. 36:609.

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 4:300 (August 1987), amended LR 10:410 (May 1984), repealed LR 25: (February 1999).

Bill A. Busbice, Jr.
Chairman

Mr. James Patton began his **Presentation of the Revised Strategic Plan** by stating this is a revised plan from the original plan presented six months ago. The revised plan only replaces the first section of the first volume in the original plan. Chairman Busbice asked who at the Legislature was reading all of these plans? Mr. Patton felt one of the primary reasons for including the supporting documentation was to establish that the work was being done. The revised plan is a re-tooling of the original plan so it better states what the Department's objectives are. Strategies have been added for the Office of Management and Finance and a section has been added for the administration program in the Office of the Secretary. The Offices of Wildlife and Fisheries had many minor changes. Mr. Patton offered to review the changes at the Commissioner's convenience. He then stated this was the Commission's plan as well as the Department's. Chairman Busbice asked when was Act 1465 passed by the Legislature? Mr. Patton answered during the 1997 Regular Session and was authored by Representative Jerry Luke LeBlanc. Chairman Busbice asked how many man hours has it taken to prepare the document? Mr. Patton felt the number of hours was quite substantial. He then noted most of the time was geared around creating performance indicators. Each agency's indicators will be evaluated on the basis on how they are doing against these performance indicators. The Department has met every deadline and produced all aspects required. Mr. Patton then acknowledged and commended Mrs. Wynnette Kees in pulling the whole document together. Mr. Patton asked the Commission to adopt the revised plan. Commissioner Gattle made a motion to approve the Revised Strategic Plan as presented. Commissioner Babin seconded the motion and it was approved with no opposition.

Update on Point of Sale Contract was presented by Mr. Craig Lamendola. A contract has been approved and was accomplished with no up-front money and no increase in staff. Louisiana is the first state to devise such a method and another state has chosen to follow our lead. The system is based on a pay-as-you-go plan where the contractor gets a transaction fee for every license issued. A mail out to all the licensed agents will occur very soon and will explain the process as well as include an application form to find

out how many will want to go to automated license sales. The public will have access to a hot line as well as a link on the Department's web page for help in answering their questions. This program will be open enrollment for anyone that supplies a \$150 security deposit for a terminal, stated Mr. Lamendola. He then explained how the system will work. The license issuing agents costs will be lowered and should be a major convenience to them as well as the public and state. The next hurdle to get over is to amend the federal laws to allow each state the option of issuing an electronic temporary federal duck stamp. Mr. Lamendola stated there is still a lot of work yet to be done. Commissioner Gattle asked if the equipment would be supplied to the agents by the vendor? Mr. Lamendola stated the Department would be buying the terminals. Then Commissioner Gattle asked if there would be a database that could restrict issuing licenses to those that have not paid fines or penalties? Mr. Lamendola answered yes. Commissioner Gattle asked if this would be for non-residents and residents? Again, Mr. Lamendola answered yes. Chairman Busbice asked if the smaller businesses that do not go automated would still be able to sell licenses? Mr. Lamendola stated there would be no dual systems. Commissioner Carver asked how would the businesses portion of the money be handled and will the agents still get \$0.50 a license? Mr. Lamendola stated the agents would get \$0.50 a transaction. Commissioner Babin asked about the Sheriff's 15 percent? Chairman Busbice asked if the system has been tested to see if it works? Mr. Lamendola stated a pilot program may be implemented in July. Chairman Busbice asked who would handle the hot line, and was told it would be managed by the Department.

Changing the subject, Chairman Busbice asked Mr. Lamendola about feral hogs or wild hogs? Mr. Lamendola stated Secretary Jenkins has asked him to investigate hogs. He then added there will be a symposium in Kansas this spring. Chairman Busbice stated he just found out hog hunting within the state is a growing activity. Then he asked Mr. Puckett about releasing wild hogs onto areas where they should not be released and if there are still any parishes that have the free range law.

Secretary Jenkins stated this program has involved a lot of work and has been very difficult. He complimented Mr. Lamendola for the terrific job he has done on this new system.

The Monthly Law Enforcement Report for January was given by Major Keith LaCaze. The following numbers of citations were issued during the month of January.

Region I - Minden - 106 citations.

Region II - Monroe - 114 citations.

Region III - Alexandria - 175 citations.

Region IV - Ferriday - 181 citations.

Region V - Lake Charles - 273 citations.

Region VI - Opelousas - 166 citations.

Region VII - Baton Rouge - 134 citations.

Region VIII - New Orleans - 143 citations.

Region IX - Thibodaux - 289 citations.

SWEP - 52 citations.

Statewide Strike Force - 76 citations.

Oyster Strike Force - 26 citations.

The grand total of citations issued statewide for the month of January was 1,581.

The aviation report for January 1999 showed enforcement pilots flew three airplanes a total of 34.6 hours for enforcement and 26.8 hours for other divisions.

Commissioner Carver asked what does the citation "hunting squirrels illegal methods - rifle" mean? Major LaCaze stated the hunter was probably using a rifle larger than .22 rimfire. Major LaCaze then explained the three electronic call cases made in Lake Charles area. Commissioner Babin stated he discussed this with Major LaCaze and was reassured the offenders were habitual and knew what they were doing. Chairman Busbice stated it is still an atrocity to see so many violations written each month and that he would like to see an improvement in the sentencing for some of the violations. Then he asked if the Department has seen any improvement from the prosecution of these cases? Major LaCaze stated there has been some improvement in a lot of areas, but still there are some setbacks with individual situations.

Warning Citations Discussion began with Major Keith LaCaze providing the Commissioners with a copy of the new forms. The Enforcement Division has talked with State Police and other agencies that have a similar program and have created a policy. For Class 1 and Class 2 violations, the agents are now provided the option of issuing a warning to a person instead of a ticket where a fine is involved. Major LaCaze felt the people will like this program and it would be a good public relations and educational tool. A pilot program has begun in District 7-A for the past several weeks. Commissioner Babin asked if there was any way to determine how many citations would not have been issued last month with the new program? Major LaCaze stated the program would begin statewide March 1, 1999 and these will be tracked by the computer

system. Commissioner Babin stated the Commission would then be able to know how many cases were made with the "hard" tickets and how many warnings will be issued and seems to be a step in the right direction. Commissioner Gattle asked for someone to explain the Civil Restitution reports included in the packets. Major LaCaze stated every time citations come into the office on Mondays, each person issued a citation is checked for any prior violations. Chairman Busbice stated he has talked with several agents and asked if a lot of the tickets should be issued? Major LaCaze stated a lot of the tickets should not be issued and if a situation warrants, it gives the option of reducing the number of "hard" tickets issued.

Chairman Busbice then asked for the first Division Report, **January 1999 Waterfowl Census, Numbers and Distribution**. Mr. Randy Myers stated the 1998-99 waterfowl season is winding down with a statewide closure occurring on January 17, 1999. Louisiana hunters had a 60 day, 6 duck season for the second year. Unusually warm weather persisted throughout the season. Warm and dry weather occurred during the first split of the duck season and the November waterfowl survey estimated 2 million birds in the coastal marshes and Catahoula Lake which is below the average of 3.1 million ducks. A mass migration of geese and ducks occurred several days after the survey was completed. The December survey indicated an estimated 2.6 million ducks and this is also below the average of 3.5 million. Heavy rains associated with a frontal system increased the waterfowl habitat in the agricultural areas of the southwest and northeast Louisiana. The majority of the State with the exception of the coastal zone received the first frost on December 16. Prior to the January survey, several cold fronts passed through the State bringing the first killing frost into coastal Louisiana. An estimated 3.3 million ducks which was down from the previous 5 year average of 3.8 million were counted. The mid-winter goose survey indicated approximately 751,000 snow geese and 102,000 white fronted geese in the State. These numbers were down from the previous mid-winter survey which was conducted December 1997. During the same period, surveys in northeast Louisiana indicated 381,000 ducks in the vastly improved agricultural areas due to the increase in rain. Overall, geographically, duck numbers were down in southwest Louisiana primarily due to the lose of good habitat forage and Tropical Storm Francis. Large numbers of ducks were observed in the Atchafalaya Delta area and the marshes just east of Terrebonne and St. Mary Parishes. Southeast marshes held high numbers of waterfowl. The overall numbers for the Mississippi River Delta were down due to the impact of Hurricane Georges. In summation, Mr. Myers stated the unusual warm and dry weather throughout the entire season had a significant impact on the waterfowl numbers in the State.

Chairman Busbice commented he had the opportunity to hunt northeast Louisiana, south Louisiana and southwest Louisiana and was asked questions on why Pecan Island did not have any ducks. He

then asked if there was a group that could follow a duck once it arrives in Louisiana, and then moves when a cold front comes through? Mr. Robert Helm stated the Department does not have a lot of that type information, but LSU did some research on pintails 3 to 5 years ago. After two to three weeks following attaching the telemetry gear and the benefit of good rains in the Mississippi Valley, the pintails moved from southwest Louisiana to northeast Louisiana and then into Arkansas. Then the reverse would sometimes occur within the same winter season, stated Mr. Helm. Chairman Busbice requested LSU do some other studies along that same line with other species. Mr. Helm stated it is an expensive effort by tracking them with airplanes.

Then Chairman Busbice asked if there has been an increase in the number of refuges the State controls or owns for ducks and geese over the past few years? Mr. Helm stated the Refuge in Kaplan is part of a system that is maintained by the Department and the U.S. Fish and Wildlife Service and the area is very effective in attracting large numbers of birds. Some changes have occurred in the refuge system in northeast Louisiana. Chairman Busbice asked if the refuges are absolutely necessary and are they feeding the ducks? Mr. Helm stated there is a lot of hunting pressure on the waterbodies and refuges may improve hunting success. Chairman Busbice stated he mentioned this so the possibility of hunting could be established on some of the refuges. Mr. Tommy Prickett stated the staff has made a conscious effort not to hide ducks on the refuges.

The 1998-99 Waterfowl Hunting Season Results began with Mr. Robert Helm stating Tropical Storm Francis had a big effect on hunting success this year. This storm ruined the September teal season and the saltwater scald caused the grass to have a winter effect. The same thing occurred when Hurricane Georges came through in southeast Louisiana. Johnson Bayou area was relatively good, but Sabine Refuge fell from harvesting 10,000 birds last year to 7,000 this year. Grand Chenier and Pecan Island had a very poor season. Terrebonne and St. Mary Parishes had big numbers of birds and some hunters mentioned this was the best season they have had in the last 15 years. The first split in southeast Louisiana was excellent but the second split was equally bad with low tides and very few new birds. Catahoula Lake experienced large amounts of rainfall with each season opening and thus a very poor season, commented Mr. Helm. However the agricultural fields in the area had a good season. North Louisiana hunters experienced a spotty season. Overall, the season was disappointing and below average, concluded Mr. Helm. Chairman Busbice stated there were a lot of coots before Christmas and then after that, there were none.

Mr. Robert Helm then reported on the **Special Snow Goose Hunting Season Regulations**. He reminded the Commissioners a proposed rule was presented to them at the December Meeting addressing the overabundance of snow geese. The approved

regulations would have allowed the use of unplugged guns and electronic calls and then eliminated a bag limit and extended the shooting hours only if the U.S. Fish and Wildlife Service agreed to these regulations. The deadline has passed and still no action from the U.S. Fish and Wildlife Service and it was not known when action would occur. The bureaucratic process of government in Washington, DC on this issue was moving very slowly. Chairman Busbice asked if the Commission should take any action? Mr. Helm stated Secretary Jenkins has contacted Louisiana's Congressional Delegates on this matter and they are watching it very closely. The effective date just keeps moving back. Commissioner Gattle asked if there was any indication of when action may occur?

Commissioner Gattle asked Ms. Nancy Hunter to explain the Civil Restitution reports included in their packets. Ms. Hunter stated the first page was a recap of monthly activities on the number of cases assessed, the amounts they were assessed, credit for the sale of any confiscated commodities, the numbers of cases paid and the amount collected. Commissioner Gattle asked how long do offenders have to pay to take advantage of a discount? Ms. Hunter answered 30 days from the date of the original invoice. Discussion continued between Commissioner Gattle and Ms. Hunter on Civil Restitution. Commissioner Babin asked Ms. Hunter, with an outstanding debt of \$1.5 million, how old are the debts and how collectible are they? Ms. Hunter stated over \$1 million is over a year old. Then Commissioner Babin asked if a fine is still owed, can that person be denied a license? Mr. Lamendola stated a flag could be placed on the licensee, but the age of it may be a problem. Secretary Jenkins stated this is a historical problem and the root of the problem is the ability, way and cost to collect the fines. Mr. Don Puckett stated the Division of Administration has finally approved a contract for a Collections Attorney and expects to have work generated towards collections. He then added that point of sale will hopefully be a valuable tool in mandating payment of fines. Commissioner McCall asked if a person can be denied a license or permit because he has not paid a fine? Mr. Puckett stated the statutes provides that non-payment of fines can result in forfeiture of hunting and fishing licenses and privileges. Commissioner Gattle stated he was glad to see the Department moving in the right direction.

After several minutes of discussion, the Commissioners agreed to hold the **June 1999 Meeting** on Thursday, June 3, 1999 beginning at 10:00 a.m. at the Baton Rouge Headquarters.

Chairman Busbice then asked if there were any **Public Comments**. Mr. Phil Bowman stated the staff from the Office of Wildlife and the Enforcement Division have been working on developing a hunting regulations package for 1999-2000. This year there will be a series of public hearings on the hunting seasons and regulations held throughout the State. The schedule includes Ruston on March 9, then Alexandria on March 15, Lake Charles on March 16 and New

Orleans on March 18, 1999 all beginning at 7:00 PM and concluding by 10:00 PM.

Commissioner McCall asked how much damage did Rockefeller Refuge receive from the storm last summer? Mr. Bowman stated damage totaled in excess of \$1 million with \$500,000 used to replace a water control structure. Habitat damage and its impacts on waterfowl was rather severe. Also fish kills occurred. Commissioner McCall asked if some of the damage has already been repaired? Mr. Bowman stated yes. Then Commissioner McCall asked if an estimate could be given on the acres of shoreline that washed away? Mr. Bowman stated approximately 50 feet of shoreline was lost just from that one storm.

There being no further business, Commissioner Babin made a motion to Adjourn the meeting and it was seconded by Commissioner Kelly.

James H. Jenkins, Jr.
Secretary

JHJ:sch

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES

RECEIPT

DATE: February 18, 1999

RECEIPT OF: 1) Reports on Striped Mullet, Black Drum, Sheepshead and Southern Flounder.

SENATE PRESIDENT (State Capitol/Senate Sub-Basement)

RECEIVED BY: Dorothy A. Dent

FOR SENATOR RANDY EWING, SENATE PRESIDENT

HOUSE SPEAKER (State Capitol/1st Floor)

RECEIVED BY: Sen King

FOR REPRESENTATIVE HUNT DOWNER, HOUSE SPEAKER

SENATE NATURAL RESOURCES COMMITTEE (State Capitol/Senate Sub-Basement)

RECEIVED BY: Dorothy A. Dent

FOR SENATOR CRAIG ROMERO, CHAIRMAN, SENATE NATURAL RESOURCES COMMITTEE

HOUSE NATURAL RESOURCES COMMITTEE (State Capitol/10th Floor)

RECEIVED BY: Sen King

FOR REPRESENTATIVE JOHN R. SMITH, CHAIRMAN, HOUSE NATURAL RESOURCES COMMITTEE

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife & Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

February 18, 1999

Honorable Randy Ewing
Senate President
P.O. Box 94183
State Capitol
Baton Rouge, LA 70804

Honorable Craig Romero
Chairman of the Senate Committee
on Natural Resources
State Capitol
Baton Rouge, LA 70804

Honorable Hunt Downer
Speaker of the House
P.O. Box 94062
State Capitol
Baton Rouge, LA 70804

Honorable John R. Smith
Chairman of the House Committee
on Natural Resources
State Capitol
Baton Rouge, LA 70804

Gentlemen:

In compliance with Act 1316 of the 1995 Regular Legislative Session, the Louisiana Marine Resources Conservation Act of 1995, enclosed are the annual reports on striped mullet, black drum, sheepshead and southern flounder which include profiles of the species, stock assessments, and spawning potential ratios. Also included are comments received to date from peer review. These reports were adopted by the Louisiana Wildlife and Fisheries Commission at its February 4, 1999 Meeting.

Thank you.

Sincerely,

James H. Jenkins, Jr.
Secretary

JHJ:sch

Enclosures

The Advocate ONLINE

Baton Rouge, Louisiana

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Published on 2/5/99

Blue/snow geese rules postponed

State Wildlife officials announced Thursday proposed new rules governing the hunting of blue/snow geese will not be in effect for the upcoming weekend.

State Waterfowl Study leader Robert Helm said the state's Wildlife Division had expected to have the new regulations, but that delays in the U.S. Fish and Wildlife Service proposals will mean hunters will have to take to the field with existing laws as defined in the state Migratory Waterfowl pamphlet.

Helm said USFWS officials indicated any approval that it called a "Conservation Order" would not come until next week.

— JOE MACALUSO

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The Advocate ONLINE

Baton Rouge, Louisiana

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Published on 2/5/99

LWFC allows agents to issue warnings instead of citations

By JOE MACALUSO

Advocate outdoors writer

Louisiana's hundreds of thousands of fishermen, hunters and boaters will encounter kinder, gentler enforcement agents under a program announced in Thursday's Wildlife and Fisheries Commission meeting.

Enforcement Division spokesman Major Keith LaCaze said a pilot program instituted in the Baton Rouge area this week allows wildlife agents to issue warning citations instead of the usual tickets handed out for violations of state game and fish regulations.

"We're giving officers the option of issuing a warning for what could be considered to be 'honest' mistakes," LaCaze told the commission.

LaCaze said the new program is limited to Class I or Class II violations, regulations like not having fishing or hunting licenses or not abiding by commission rules on state-owned wildlife management areas.

He further explained that the warning citations will be monitored — the citations are filed weekly with state headquarters — and anyone showing up with warning citations for the same regulation will be issued what he called a "hard" ticket.

"It's a program we believe will be educational and just good public relations. It's designed to correct a violation because of a lack of knowledge," LaCaze said.

He said the program will continue in the Baton Rouge area and will be made statewide in March.

The seven-man commission also heard a report on the new license-issuing system the Department of Wildlife and Fisheries plans to bring on-line in June in limited areas of the state. The computer system will issue licenses from a central source via a telephone-computer link with license sellers in the state. The new program will cover resident and nonresident licenses.

The commission voted to continue regulations on high-fence

hunting operations by restating that the whitetail deer season was closed but that hunting for exotic animals — animals not native to the state — will be allowed to continue throughout the year. The vote was needed because the current regulatory agreement with the Department of Agriculture and Forestry ends Feb. 28.

The LWFC also voted to close the offshore shrimp season from Eugene Island to Freshwater Bayou at 6:01 a.m. Monday. The action was taken at the urging of state biologists whose tests have indicated that white shrimp in the area were more than the 100-per-pound limit.

In other action, the LWFC also extended the taking of oysters in the Bay Junop area through May 15; ratified new seismic regulations that will increase revenue from oil and gas exploration on state lands; adopted the Department of Wildlife and Fisheries new Strategic Plan for Operations; and, approved a resolution supporting a Congressional move to evenly divide oil and gas revenues from offshore operations in federal waters between the federal and state governments.

The department's Marine Fisheries Section also reported that the biological status of sheepshead, striped mullet, southern flounder and black drum are much the same as 1997 and are in "good shape" and studies show that all four species are being taken in sustainable rates.

Marine biologist Harry Blanchet said 1997 takes were 4.68 million pounds of sheepshead, 8.7 million pounds of striped mullet, 582,690 pounds of southern flounder and 3.014 million pounds of black drum. The catch of sheepshead was the second highest in the state in the last 16 years, while respective flounder and black drum catches were the third lowest and fourth lowest during that period.

The commission also set a meeting for June 3 at Wildlife and Fisheries headquarters.

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**COMMISSION MEETING
ROLL CALL**

Thursday, February 4, 1999
Baton Rouge, LA
Wildlife & Fisheries Building

	Attended	Absent
Bill Busbice (Chairman)	<u>✓</u>	—
Tom Kelly	<u>✓</u>	—
Daniel Babin	<u>✓</u>	—
Glynn Carver	<u>✓</u>	—
Tom Gattle	<u>✓</u>	—
Jerald Hanchey	<u>✓</u>	—
Norman McCall	<u>✓</u>	—

Mr. Chairman:

There are 7 Commissioners in attendance and we have a quorum.
Secretary Jenkins is also present.

AGENDA

LOUISIANA WILDLIFE AND FISHERIES COMMISSION
BATON ROUGE, LA
February 4, 1999
10:00 AM

1. Roll Call
2. Approval of Minutes of January 7, 1999
3. Conservation Reinvestment Act Resolution - Phil Bowman
4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves - Dave Moreland
5. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum - Harry Blanchet
6. Consideration of Offshore Shrimp Closure - Mark Schexnayder
7. Declaration of Emergency - Oyster Season in Bay Junop - Ron Dugas
8. Rule Ratification - Seismic Regulations - Heather Finley
9. Presentation of the Revised Strategic Plan - James Patton
10. Update on Point of Sale Contract - Craig Lamendola
11. Enforcement & Aviation Reports/January - Keith LaCaze
12. Warning Citations Discussion - Keith LaCaze
13. Division Reports
 - a. January 1999 Waterfowl Census, Numbers and Distribution - Randy Myers
 - b. 1998-99 Waterfowl Hunting Season Results - Robert Helm
 - c. Special Snow Goose Hunting Season Regulations - Robert Helm
14. Set June 1999 Meeting Date
15. Public Comments
16. Adjournment

AGENDA

LOUISIANA WILDLIFE AND FISHERIES COMMISSION
BATON ROUGE, LA
February 4, 1999
10:00 AM

- ✓1. Roll Call
- ✓2. Approval of Minutes of January 7, 1999
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- ✓4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves - Dave Moreland
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- ✓7. Declaration of Emergency - Oyster Season in Bay Junop - Ron Dugas
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- ✓13. Division Reports
 - ✓a. January 1999 Waterfowl Census, Numbers and Distribution - Randy Myers
 - ✓b. 1998-99 Waterfowl Hunting Season Results - Robert Helm
 - ✓c. Special Snow Goose Hunting Season Regulations - Robert Helm
- ✓14. Set June 1999 Meeting Date
- ✓15. Public Comments
16. Adjournment

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 4, 1999

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission Meeting held in Baton Rouge, LA, February 4, 1999.

WHEREAS, the Louisiana Department of Agriculture and Forestry has been given certain authority to regulate farm-raised white-tailed deer, elk, exotic deer and antelope, raised for commercial purposes, and

WHEREAS, the Louisiana Department of Agriculture and Forestry (LDAF) developed rules pertaining to farm-raised white-tailed deer, elk, exotic deer and antelope, and

WHEREAS, these rules allowed for the raising, propagation, and hunting of imported exotic deer and antelope, elk, and farm-raised white-tailed deer within the confines of pens specified by LDAF rules and regulations,

WHEREAS, a dispute arose over the regulation of hunting and the capture of wild white-tailed deer within LDAF licensed deer farms, and

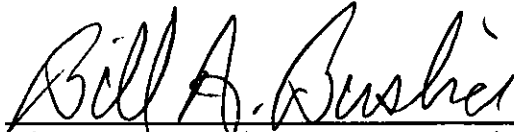
WHEREAS, the Louisiana Department of Wildlife and Fisheries and Louisiana Wildlife and Fisheries Commission filed a petition for a Temporary Restraining Order, Injunctive Relief, and Declaratory Judgement in the 19th JDC to resolve the disputed issues, and


WHEREAS, a Stipulated Judgement was rendered in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th JDC, and

WHEREAS, the Stipulated Judgement set terms for the regulation of hunting and

WHEREAS, the authority to establish hunting seasons is vested with the Louisiana Wildlife and Fisheries Commission exclusively, and

THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission adopts the attached Declaration of Emergency to establish hunting seasons and regulations for white-tailed deer, elk, exotic deer and antelope on Supplemented Hunting Preserves.


Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission


James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) of the Administrative Procedure Act, and under authority of Louisiana Constitution, Article IX, Section 7, R.S. 36:601 et seq., R.S. 56:115, R.S. 56:171 et seq. and R.S. 56:651 et seq., the Wildlife and Fisheries Commission adopts the following Emergency Rule.

This Declaration of Emergency is necessary to implement portions of the written stipulations entered into on August 10, 1998, in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th Judicial District Court, and further to provide for regulation of hunting of white-tailed deer and exotics on Supplemented Hunting Preserves. This Declaration of Emergency will govern the regulation of hunting on Supplemented Hunting Preserves until the ratification of permanent rules.

Supplemented Hunting Preserves: Hunting Seasons and Deer

Management Assistance Program Participation

A. Definitions

Exotics: For purposes of this rule means any animal of the family Bovidae (except the Tribe Bovini [cattle]) or Cervidae which is not indigenous to Louisiana and which is confined on a Supplemented Hunting Preserve. Exotics shall include, but are not limited to, fallow deer, red deer, elk, sika deer, axis deer, and black buck antelope.

Hunting: In its different tenses and for purposes of this rule means to take or attempt to take, in accordance with R.S. 56:8.

Same as Outside: For purposes of this rule means hunting on a Supplemented Hunting Preserve must conform to applicable statutes and rules governing hunting and deer hunting, as provided for in Title 56 of the Louisiana Revised Statutes and as established annually by the Wildlife and Fisheries Commission (LWFC).

Supplemented Hunting Preserve: For purposes of this rule means any enclosure for which a current Farm-Raising License has been issued by the Department of Agriculture and Forestry (LDAF) with concurrence of the Department of Wildlife and Fisheries (LDWF) and is authorized in writing by the LDAF and LDWF to permit hunting.

White-tailed Deer: For purposes of this rule means any animal of the species Odocoileus virginianus which is confined on a Supplemented Hunting Preserve.

B. Hunting Seasons

1. White-tailed Deer: All hunting seasons for farm-raised white-tailed deer are still hunt only.

a. Archery: October 1, 1999 - January 31, 2000, either-sex.

b. Modern Firearms: November 1 - December 6, 1999; December 21 - 23, 1999; and December 26, 1999 - January 31, 2000.

c. Either-sex deer may be taken November 1-3, December 21-23, and December 26-30, otherwise, all modern firearm dates are bucks only. (Either-sex deer may also be taken in accordance with provisions of the Deer Management Assistance Program).

d. Muzzleloader: December 7 - December 20, 1999, either-sex.

2. Exotics: Year round.

C. Methods of Take

1. White-tailed Deer: Same as outside.
2. Exotics: Exotics may be taken with longbow (including compound bow) and arrow; shotguns not larger than 10 gauge, loaded with buckshot or rifled slug; handguns and rifles no smaller than .22 caliber centerfire; or muzzleloading rifles or pistols, .44 caliber minimum, or shotguns 10 gauge or smaller, all of which must load exclusively from the muzzle or cap and ball cylinder, using black powder or an approved substitute only, and using ball or bullet projectile, including sabot bullets only.

D. Shooting Hours

1. White-tailed Deer: Same as outside.
2. Exotics: one-half hour before sunrise to one-half hour after sunset.

E. Bag Limit

1. Farm-Raised White-tailed Deer: Same as outside.
2. Exotics: No limit.

F. Hunting Licenses

1. White-tailed Deer: Same as outside.
2. Exotics: No person shall hunt any exotic without possessing a valid basic and big game hunting license.

G. Tagging. White-tailed Deer and Exotics: Each animal shall be tagged in the left ear or left antler immediately upon being killed and before being moved from the site of the kill with a tag provided by the LDAF. The tag shall remain with the carcass at all times.

H. Deer Management Assistance Program. Supplemented Hunting Preserves may be eligible to participate in the Deer Management Assistance Program (DMAP) in accordance with the DMAP rules.

I. Additional Restrictions. Except as otherwise specified herein, all of the provisions of Title 56 of the Louisiana Revised Statutes and the LWFC rules pertaining to the hunting and possession of white-tailed deer shall apply to white-tailed deer and exotics located on Supplemented Hunting Preserves.

J. Effective Date. This Declaration of Emergency shall become effective on February 28, 1999, and supplant any prior Declaration of Emergency pertaining to hunting of farm-raised deer and exotics.

Bill A. Busbice, Jr.

Chairman

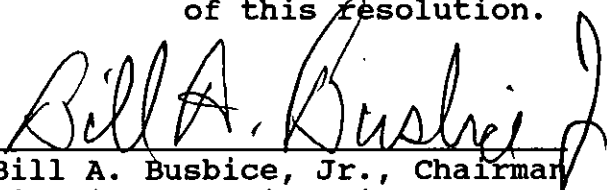
RESOLUTION


1999 Offshore Shrimp Season Closure adopted by the Louisiana Wildlife and Fisheries Commission

- WHEREAS, R.S. 56:497 provides the open shrimp seasons for all or part of the state waters shall be fixed by the Commission, and
- WHEREAS, R.S. 56:497 provides the Commission shall have the authority to set special seasons for all or part of the state waters, and
- WHEREAS, R.S. 56:498 provides the minimum legal count on white shrimp is 100 (whole shrimp) count per pound, except during the time period from October fifteenth through the third Monday in December when there shall be no count, and
- WHEREAS, in the State's Territorial Waters, water temperatures are below 20 degrees Centigrade and the growth rate of white shrimp is therefore slow, and
- WHEREAS, current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in a portion of the State's Territorial Waters do not average 100 count minimum size or larger and are present in significant numbers, now
- THEREFORE BE IT RESOLVED, the Wildlife and Fisheries Commission does hereby order a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel Buoy Line to the eastern shore of Freshwater Bayou, at 6:01 a.m. on Monday, February 8, 1999.
- BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

BE IT FURTHER RESOLVED, the Declaration of Emergency closing the State's Territorial Waters is attached to and made a part of this resolution.


Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission


James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) and R.S. 49:967 of the Administrative Procedure Act which allows the Wildlife and Fisheries Commission to use emergency procedures to set shrimp seasons, and R.S. 56:497 which provides that the Wildlife and Fisheries Commission shall have the authority to open or close the State's offshore waters to shrimping, the Wildlife and Fisheries Commission hereby orders a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel buoy line to the eastern shore of Freshwater Bayou. This closure is effective at 6:01 a.m., Monday, February 8, 1999.

R.S. 56:498 provides that the minimum legal count on white shrimp is 100 (whole shrimp) count per pound after the third Monday in December. Current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in this portion of the State's outside waters do not average 100 count minimum legal size or larger and are present in significant numbers. This action is being taken to protect these small white shrimp and allow them the opportunity to grow to a more valuable size.

The Wildlife and Fisheries Commission authorizes the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the

remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary; and hereby authorizes the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

Bill A. Busbice, Jr.

Chairman

RESOLUTION

Bay Junop Oyster Seed Reservation Season Extension
February 4, 1999
Louisiana Wildlife and Fisheries Commission
Louisiana Department of Wildlife and Fisheries

WHEREAS, the Louisiana Wildlife and Fisheries Commission set the 1998/1999 oyster season to run from September 9, 1998 to April 1, 1999 at its August 1998 meeting with the exception of Calcasieu Oyster Tong Area, and

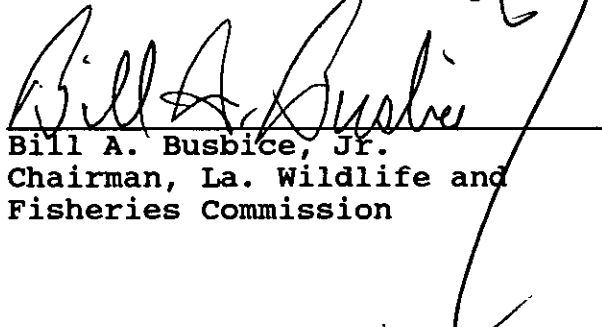
WHEREAS, R.S. 56:433 B(1) allows for Commission consideration of an extension to May 15th of the oyster season, and

WHEREAS, virtually all of the Bay Junop Oyster Seed Reservation was closed by the State Health Department during the 1998/1999 oyster season, and

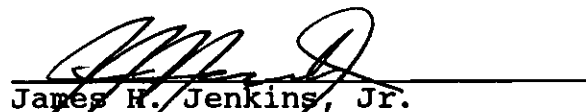
WHEREAS, the Health Department has indicated that the entire Bay Junop Oyster Seed Reservation will meet the harvesting criteria in May.

THEREFORE BE IT RESOLVED, the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999, and

BE IT FURTHER RESOLVED, that the remaining public oyster grounds will close as previously scheduled.



Bill A. Busbice, Jr.
Chairman, La. Wildlife and
Fisheries Commission



James H. Jenkins, Jr.
Secretary, La. Department of
Wildlife and Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

In accordance with the emergency provisions of the Administrative Procedure Act, R.S. 49:953(B) and 967, and under the authority of R.S. 56:433 and R.S. 56:434, notice is hereby given that the Secretary of the Department of Wildlife and Fisheries and the Wildlife and Fisheries Commission hereby declare:

That the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999.

Bill A. Busbice, Jr.

Chairman

RESOLUTION IN SUPPORT OF TWW/OCS INITIATIVES IN CONGRESS

- WHEREAS, legislation referred to as the Conservation and Reinvestment Act of 1998, was introduced in the 105th Congress, which proposed to direct offshore oil and gas revenues to certain states for coastal impact assistance, land based outdoor recreation and wildlife conservation programs; and
- WHEREAS, similar legislation was recently reintroduced in the Senate as Senate Bill 25, known as the Conservation and Reinvestment Act of 1999; and
- WHEREAS, these funds would come from revenues generated nationally from oil, gas, and mineral development in the federal waters of the outer continental shelf (OCS); and
- WHEREAS, 50% of the revenue from mineral development on federal lands is currently shared with states, while revenue from mineral development in federal waters is not; and
- WHEREAS, this proposed legislation would allocate a certain percentage of OCS revenues to coastal states based on their shoreline miles, coastal population and offshore oil and gas production; and
- WHEREAS, Louisiana's share of such OCS funds could be more than \$350 million annually; and
- WHEREAS, the proposed legislation would allocate a percentage of OCS revenues for wildlife programs; and
- WHEREAS, the proposed legislation would provide a long-term source of revenues to support enhancements to existing wildlife (nongame, game, and enforcement) programs in the Department of Wildlife and Fisheries; and
- WHEREAS, more than 80% of Louisiana's vertebrate species are nongame, and population declines in certain species of birds have been documented in Louisiana; and
- WHEREAS, these funds are sorely needed for coastal impact assistance, to help satisfy public demand for wildlife and outdoor recreation programs and facilities statewide, and to provide other related economic, social, and environmental benefits to the people of Louisiana; and
- WHEREAS, the Louisiana Congressional delegation has played an instrumental role in developing such national legislation;
- THEREFORE BE IT RESOLVED that the Louisiana Wildlife and Fisheries Commission applauds the Louisiana Congressional

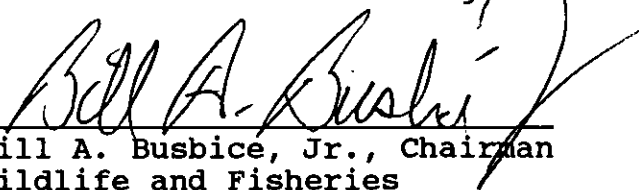
delegation for its leadership in introducing this landmark legislation, and further urges and requests its continued support for its reintroduction in the House and passage in the 106th Congress.

BE IT FURTHER RESOLVED that specific language be added to Senate Bill No. 25 of the 106th Congress conforming the percentage of funding allocated for wildlife conservation and management programs to not less than 10 percent, which will match that proposed in House Bill No. 4717 of the 105th Congress.

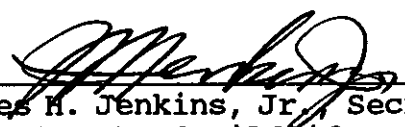
BE IT FURTHER RESOLVED that the Louisiana Wildlife and Fisheries Commission supports in full the proposal of sharing with the states a level of not less than 50% of the revenues derived from federal oil and gas development on the OCS, and being distributed to all coastal states pursuant to the formula recommended by the OCS Policy Committee to the Department of Interior in October, 1997.

BE IT FURTHER RESOLVED that any uncommitted members of Congress are hereby respectfully urged and requested to sign onto the appropriate legislative instrument.

BE IT FURTHER RESOLVED that a copy of this resolution be sent to Senator Frank Murkowski, Chairman of the Senate Energy and Natural Resources Committee, and Congressman Don Young, Chairman of the House Resources Committee, and Louisiana's Congressional delegation.



Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission



James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable Frank H. Murkowski
United States Senator
United States Senate
Washington, DC 20510

Dear Senator Murkowski:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

I am writing in support of the proposed legislation, and to commend you in your efforts in developing and supporting this landmark legislation. I also ask that you uphold specific language in the proposed legislation that would allocate the funding level of Title III at not less than 10 percent.

I have enclosed a resolution passed by the Louisiana Wildlife and Fisheries Commission at its regular meeting on February 4, 1999, in support of the legislation. Thanks for your continued support.

Sincerely,

A handwritten signature in dark ink, appearing to read "J. H. Jenkins, Jr.", written over a horizontal line.

James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable Don Young
United States Representative
U.S. House of Representatives
Washington, DC 20515

Dear Congressman Young:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable John Breaux
United States Senator
516 Hart Senate Building
Washington, DC 20510

Dear Senator Breaux:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable Mary Landrieu
United States Senator
825 Hart Senate Building
Washington, DC 20510

Dear Senator Landrieu:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable Robert Livingston
United States Representative
2406 Rayburn House Building
Washington, DC 20515

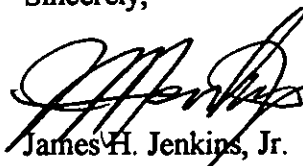
Dear Congressman Livingston:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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Sincerely,



James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable William Jefferson
United States Representative
240 Cannon House Building
Washington, DC 20515

Dear Congressman Jefferson:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable W. J. "Billy" Tauzin
United States Representative
2183 Rayburn House Building
Washington, DC 20515

Dear Congressman Tauzin:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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Sincerely,

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable James McCrery
United States Representative
2104 Rayburn House Building
Washington, DC 20515

Dear Congressman McCrery:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable John Cooksey
United States Representative
317 Cannon House Building
Washington, DC 20515

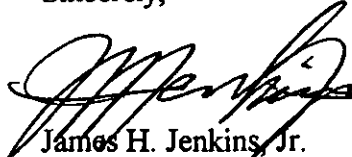
Dear Congressman Cooksey:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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Sincerely,



James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable Richard Baker
United States Representative
434 Cannon House Building
Washington, DC 20515

Dear Congressman Baker:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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I have enclosed a resolution passed by the Louisiana Wildlife and Fisheries Commission at its regular meeting on February 4, 1999, in support of the legislation. Thanks for your continued support.

Sincerely,

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James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

8 February 1999

Honorable Chris John
United States Representative
1504 Longworth House Building
Washington, DC 20515


Dear Congressman John:

The Conservation and Reinvestment Act of 1999 may very well be the most significant federal legislation regarding wildlife programs in decades. Its comprehensive nature and innovative funding approach gives it broad-base support and the likelihood of benefitting traditional and nontraditional wildlife activities. Its three-element approach--conservation, recreation, and education--will provide Louisianians with more opportunities to learn about and enjoy our natural heritage.

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I have enclosed a resolution passed by the Louisiana Wildlife and Fisheries Commission at its regular meeting on February 4, 1999, in support of the legislation. Thanks for your continued support.

Sincerely,



James H. Jenkins, Jr.
Secretary

JHJ:gdl

Enclosure

RESOLUTION IN SUPPORT OF TWW/OCS INITIATIVES IN CONGRESS

WHEREAS, legislation referred to as the Conservation and Reinvestment Act of 1998, was introduced in the 105th Congress, which proposed to direct offshore oil and gas revenues to certain states for coastal impact assistance, land based outdoor recreation and wildlife conservation programs; and

WHEREAS, similar legislation was recently reintroduced in the Senate as Senate Bill 25, known as the Conservation and Reinvestment Act of 1999; and

WHEREAS, these funds would come from revenues generated nationally from oil, gas, and mineral development in the federal waters of the outer continental shelf (OCS); and

WHEREAS, 50% of the revenue from mineral development on federal lands is currently shared with states, while revenue from mineral development in federal waters is not; and

WHEREAS, this proposed legislation would allocate a certain percentage of OCS revenues to coastal states based on their shoreline miles, coastal population and offshore oil and gas production; and

WHEREAS, Louisiana's share of such OCS funds could be more than \$350 million annually; and

WHEREAS, the proposed legislation would allocate a percentage of OCS revenues for wildlife programs; and

WHEREAS, the proposed legislation would provide a long-term source of revenues to support enhancements to existing wildlife (nongame, game, and enforcement) programs in the Department of Wildlife and Fisheries; and

WHEREAS, more than 80% of Louisiana's vertebrate species are nongame, and population declines in certain species of birds have been documented in Louisiana; and

WHEREAS, these funds are sorely needed for coastal impact assistance, to help satisfy public demand for wildlife and outdoor recreation programs and facilities statewide, and to provide other related economic, social, and environmental benefits to the people of Louisiana; and

WHEREAS, the Louisiana Congressional delegation has played an instrumental role in developing such national legislation;

THEREFORE BE IT RESOLVED that the Louisiana Wildlife and Fisheries Commission applauds the Louisiana Congressional

*Sen Landrieu
& Breaux*

*Cong
John Tauscher
& Jefferson
Support
Pushing*

delegation for its leadership in introducing this landmark legislation, and further urges and requests its continued support for its reintroduction in the House and passage in the 106th Congress.

BE IT FURTHER RESOLVED that specific language be added to Senate Bill No. 25 of the 106th Congress conforming the percentage of funding allocated for wildlife conservation and management programs to not less than 10 percent, which will match that proposed in House Bill No. 4717 of the 105th Congress.

BE IT FURTHER RESOLVED that the Louisiana Wildlife and Fisheries Commission supports in full the proposal of sharing with the states a level of not less than 50% of the revenues derived from federal oil and gas development on the OCS, and being distributed to all coastal states pursuant to the formula recommended by the OCS Policy Committee to the Department of Interior in October, 1997.

BE IT FURTHER RESOLVED that any uncommitted members of Congress are hereby respectfully urged and requested to sign onto the appropriate legislative instrument.

BE IT FURTHER RESOLVED that a copy of this resolution be sent to Senator Frank Murkowski, Chairman of the Senate Energy and Natural Resources Committee, and Congressman Don Young, Chairman of the House Resources Committee, and Louisiana's Congressional delegation.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 4, 1999

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission Meeting held in Baton Rouge, LA, February 4, 1999.

- WHEREAS, the Louisiana Department of Agriculture and Forestry has been given certain authority to regulate farm-raised white-tailed deer, elk, exotic deer and antelope, raised for commercial purposes, and
- WHEREAS, the Louisiana Department of Agriculture and Forestry (LDAF) developed rules pertaining to farm-raised white-tailed deer, elk, exotic deer and antelope, and
- WHEREAS, these rules allowed for the raising, propagation, and hunting of imported exotic deer and antelope, elk, and farm-raised white-tailed deer within the confines of pens specified by LDAF rules and regulations,
- WHEREAS, a dispute arose over the regulation of hunting and the capture of wild white-tailed deer within LDAF licensed deer farms, and
- WHEREAS, the Louisiana Department of Wildlife and Fisheries and Louisiana Wildlife and Fisheries Commission filed a petition for a Temporary Restraining Order, Injunctive Relief, and Declaratory Judgement in the 19th JDC to resolve the disputed issues, and
- WHEREAS, a Stipulated Judgement was rendered in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th JDC, and
- WHEREAS, the Stipulated Judgement set terms for the regulation of hunting and
- WHEREAS, the authority to establish hunting seasons is vested with the Louisiana Wildlife and Fisheries Commission exclusively, and
- THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission adopts the attached Declaration of Emergency to establish hunting seasons and regulations for white-tailed deer, elk, exotic deer and antelope on Supplemented Hunting Preserves.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) of the Administrative Procedure Act, and under authority of Louisiana Constitution, Article IX, Section 7, R.S. 36:601 et seq., R.S. 56:115, R.S. 56:171 et seq. and R.S. 56:651 et seq., the Wildlife and Fisheries Commission adopts the following Emergency Rule.

This Declaration of Emergency is necessary to implement portions of the written stipulations entered into on August 10, 1998, in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th Judicial District Court, and further to provide for regulation of hunting of white-tailed deer and exotics on Supplemented Hunting Preserves. This Declaration of Emergency will govern the regulation of hunting on Supplemented Hunting Preserves until the ratification of permanent rules.

Supplemented Hunting Preserves: Hunting Seasons and Deer

Management Assistance Program Participation

A. Definitions

Exotics: For purposes of this rule means any animal of the family Bovidae (except the Tribe Bovini [cattle]) or Cervidae which is not indigenous to Louisiana and which is confined on a Supplemented Hunting Preserve. Exotics shall include, but are not limited to, fallow deer, red deer, elk, sika deer, axis deer, and black buck antelope.

Hunting: In its different tenses and for purposes of this rule means to take or attempt to take, in accordance with R.S. 56:8.

Same as Outside: For purposes of this rule means hunting on a Supplemented Hunting Preserve must conform to applicable statutes and rules governing hunting and deer hunting, as provided for in Title 56 of the Louisiana Revised Statutes and as established annually by the Wildlife and Fisheries Commission (LWFC).

Supplemented Hunting Preserve: For purposes of this rule means any enclosure for which a current Farm-Raising License has been issued by the Department of Agriculture and Forestry (LDAF) with concurrence of the Department of Wildlife and Fisheries (LDWF) and is authorized in writing by the LDAF and LDWF to permit hunting.

White-tailed Deer: For purposes of this rule means any animal of the species Odocoileus virginianus which is confined on a Supplemented Hunting Preserve.

B. Hunting Seasons

1. White-tailed Deer: All hunting seasons for farm-raised white-tailed deer are still hunt only.

a. Archery: October 1, 1999 - January 31, 2000, either-sex.

b. Modern Firearms: November 1 - December 6, 1999; December 21 - 23, 1999; and December 26, 1999 - January 31, 2000.

c. Either-sex deer may be taken November 1-3, December 21-23, and December 26-30, otherwise, all modern firearm dates are bucks only. (Either-sex deer may also be taken in accordance with provisions of the Deer Management Assistance Program).

d. Muzzleloader: December 7 - December 20, 1999, either-sex.

2. Exotics: Year round.

C. Methods of Take

1. White-tailed Deer: Same as outside.

2. Exotics: Exotics may be taken with longbow (including compound bow) and arrow; shotguns not larger than 10 gauge, loaded with buckshot or rifled slug; handguns and rifles no smaller than .22 caliber centerfire; or muzzleloading rifles or pistols, .44 caliber minimum, or shotguns 10 gauge or smaller, all of which must load exclusively from the muzzle or cap and ball cylinder, using black powder or an approved substitute only, and using ball or bullet projectile, including sabot bullets only.

D. Shooting Hours

1. White-tailed Deer: Same as outside.

2. Exotics: one-half hour before sunrise to one-half hour after sunset.

E. Bag Limit

1. Farm-Raised White-tailed Deer: Same as outside.

2. Exotics: No limit.

F. Hunting Licenses

1. White-tailed Deer: Same as outside.

2. Exotics: No person shall hunt any exotic without possessing a valid basic and big game hunting license.

G. Tagging. White-tailed Deer and Exotics: Each animal shall be tagged in the left ear or left antler immediately upon being killed and before being moved from the site of the kill with a tag provided by the LDAF. The tag shall remain with the carcass at all times.

H. Deer Management Assistance Program. Supplemented Hunting Preserves may be eligible to participate in the Deer Management Assistance Program (DMAP) in accordance with the DMAP rules.

I. Additional Restrictions. Except as otherwise specified herein, all of the provisions of Title 56 of the Louisiana Revised Statutes and the LWFC rules pertaining to the hunting and possession of white-tailed deer shall apply to white-tailed deer and exotics located on Supplemented Hunting Preserves.

J. Effective Date. This Declaration of Emergency shall become effective on February 28, 1999, and supplant any prior Declaration of Emergency pertaining to hunting of farm-raised deer and exotics.

Bill A. Busbice, Jr.

Chairman

Blanchet, Harry

From: Andrew James Fischer [SMTP:afische@tiger.lsu.edu]

Sent: Wednesday, February 03, 1999 12:11 PM

To: Blanchet, Harry

Subject: southern flounder stock assessment

Dear Harry,

I have been asked by Dr. Wilson to review the southern flounder stock assessment and provide you with any comments I may have. I apologize for not getting this to you sooner, I have been in the field. I have noticed that you have included in your female VonBertalanffy growth model that you age 0 juveniles. I have run a likelihood ratio test between models with and without juveniles and the test indicated a significant difference between the two ($P > 2.15306 \times 10^{-17}$). The inclusion of these juveniles is most likely the explanation for your high K value of 0.8846 (I also got a high K value when including age 0 juveniles in my model). I came up with a K value that was much closer to published data when I excluded the age 0 juveniles. With the help of Dr. Geaghan in experimental Statistics, I used a method that Lamont used to test outliers to test each of these juvenile points against the predicted values at age for each sex. This test indicated that these points are different from the predicted values so I did not include them in my models. I hope that my comments may be of use to you and again, I am very sorry that I was not able to get them to you sooner.

Andy Fischer



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, FL 33149

Phone: 305-361-4295 Fax: 305-361-4219
email: joseph.powers@noaa.gov

February 2, 1999

Mr. Harry Blanchet (fax: 504-765-2489)
Marine Fisheries Division
Finfish Programs Manager
Department of Wildlife and Fisheries
P.O. Box 98000
Baton Rouge, LA 70898-9000

Dear Harry:

In your letter of January 22 to Andy Kemmerer you asked for a review of the Louisiana assessment work on black drum, sheepshead, southern flounder and striped mullet by February 2. Unfortunately, your request was not received until late in the afternoon on February 1st. Nevertheless, I have given the documents a quick reading and have the following short comments:

The analyses assume that age-distributions are stable and then disappearance rates are estimated using standard catch curve approaches. Judging from the fits to the catch curves it does not appear that the stable age-distribution assumption is violated to any degree, so it appears that the analyses are fairly robust. Hence, the management advice also appears to be robust.

However, in terms of the explanation it would be helpful if the differences between the CPUE trends from MRFSS versus trammel net monitoring versus seine monitoring could be explored more. Can the difference be explained in terms of different sizes vulnerable to the gears? If so, the arguments would be strengthened.

I have distributed the documents to other scientists here in Miami for their review and comments at their prerogative, recognizing that you will not be able to incorporate their comments into your February 4 presentation.

We hope that these will be helpful.

Sincerely,

Joseph E. Powers, PhD
Senior Stock Assessment Scientist

cc: F/SEC B. Brown
F/SER A. Kemmerer (Control # SER99-017)
F/SER2 J. Weaver
F/SEC J. Scott





Jeb Bush
Governor

Department of Environmental Protection

Florida Marine Research Institute
100 Eighth Avenue S.E.
St. Petersburg, Florida 33701-5095

David B. Struhs
Secretary

PHONE: 727-896-8626 FAX: 727-823-0166

FACSIMILE COVER SHEET

DATE:

1/27/99

TO:

Harry Blanchet

OF:

LA Dept. of Wildlife and Fisheries

FAX #:

504 765-2489

PHONE #:

504 765-2889

FROM:

Stu Kennedy

OF PAGES:

1

MESSAGE:

Harry: We will be happy to review the profiles for the four species but we will not be able to meet your deadline which is only three days away. We can ~~to~~ have them done by the end of next week 2/5. Call me if you have questions.

Stu

FLORIDA MARINE RESEARCH INSTITUTE



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Open House

Saturday
April 24, 1999

10 am—4 pm

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END



Department of Environmental Protection
FLORIDA MARINE RESEARCH INSTITUTE

Fisheries Assessment: JEAN WILLIAMS

100 Eighth Avenue, SE 14S-FA

St Petersburg FL 33701-5095

PHONE: 727*896*8626

SunCom: 523*1011

FISHERIES ASSESSMENT FAX: 727*893*1374

FL DEP/FMRI MAIN FAX: 727*823*0166

FL DEP/FMRI FAX COVER SHEET

DATE: 2/8/99

TO: Harry Blanchet, Fish Program Manager

OF: Louisiana Dept of Wildlife & Fisheries

FAX#: 225+765-2489

PHONE#: " 765-2800

NO OF PAGES (INCLUDES COVER): 2

From: See info. below/re: species profile info.

Message: For black drum: Mike Murphy had no comments
For sheepshead: Tim MacDonald's comments attached.

At this time, neither S. flounder (Mike Johnson) nor mullet
(Behzad Mahmudi) comments have been relayed to me. I
should hear from Mike Johnson by Tues, 2/9 and Behzad will return

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

*** **

here on
Thurs, 2/11.
Jean Williams
Fisheries Assessment

Review of the Sheepshead Stock Assessment for the Louisiana Department of Wildlife and Fisheries

My experiences with sheepshead are in the areas of age and growth; reproduction; and the estimation of juvenile, subadult and adult relative abundances from fisheries-independent data. My comments, therefore, tend to emphasize these areas, rather than the YPR and SPR methodologies and results.

5.1 Growth

The von Bertalanffy growth parameters in this section were based upon sheepshead harvested by recreational and commercial methodology. Although I realize that this is the best available data, Beckman et al. (1991) indicated that these parameters probably do not represent the Louisiana sheepshead population as a whole. Fisheries-independent data from Tampa Bay, Florida indicate a much lower growth coefficient (K), and slower growth rate than that reported by Beckman et al. (1991). Although other factors could explain this difference, there is the possibility that it is due to age and size related biases introduced by fishery-dependent data.

5.2 Mortality

Results of natural mortality by Pauly's length-based method are listed separately as 0.78 in the text and 0.40 in the summary of the different mortality estimation methods. I calculate 0.396.

5.3 Disappearance Rates and Fishing Mortality

It's a small thing, but in paragraph 3 there is a typo, "ogive", right before the regression equation.

5.4 Research and Data Needs

I'd recommend that, in addition to the annual age-length keys that are being developed to provide catch-at-age data, fishery-independent age data be collected. These data could be used to determine the age and size structure of the sheepshead population; to better define the von Bertalanffy growth parameters for the Louisiana sheepshead population as a whole; and, possibly, to estimate total instantaneous mortality. These collections should rely on gears other than trammel nets which, in Florida waters, have been shown to be biased towards larger, and older sheepshead.

Literature cited

Beckman, D.W., A.L. Stanley, J.H. Render, and C.A. Wilson. 1991. Age and growth-rate estimation of sheepshead *Archosargus probatocephalus* in Louisiana waters using otoliths. Fish. Bull., U.S. 89:1-8.

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OF: Louisiana Dept Wildlife & Fisheries

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PHONE#: " " 2889

NO OF PAGES (INCLUDES COVER): 2

From: John R Williams for Stu Kennedy

Message: Dear Harry As discussed, these
are comments regarding Southern flounder
We should have mullet comments
to you by Thursday, 2/11.
John R Williams

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

** ***** **

INTEROFFICE MEMORANDUM

DATE: 09-Feb-1999 11:00am
FROM: Mike R. Johnson
FL DEP/FL Marine Research Institute-S FL Regional Lab, Marathon
SUBJECT: Louisiana southern flounder stock assessment species profile

I have reviewed the Louisiana stock assessment on southern flounder which you had mailed to me last week. Overall, the document looks good. The von Bertalanffy growth parameters, length/weight regression, and age/length key appears within the ranges of published results from other states. The figures concerning commercial and recreational landings agree with other Landings data from Louisiana.

The only editorial comments I have are as follows:

Page 1: It might be helpful to define the von Bertalanffy equation parameters. The reader may not necessarily know which parameters are being used in the equation.

Page 4, second paragraph: There is a typo on the last sentence reading: "This selection'ogive' is then regressed in the equation."

Page 7, second paragraph, second to the last sentence: "CPUE" should be uppercase throughout.

Page 7, second paragraph, last sentence. There should be an apostrophe in the word "Departments" and no comma after the word.

Michael R. Johnson
Department of Environmental Protection
Florida Marine Research Institute
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Marathon, Florida 33050
Voice: (305) 289-2330; FAX: (305) 289-2334
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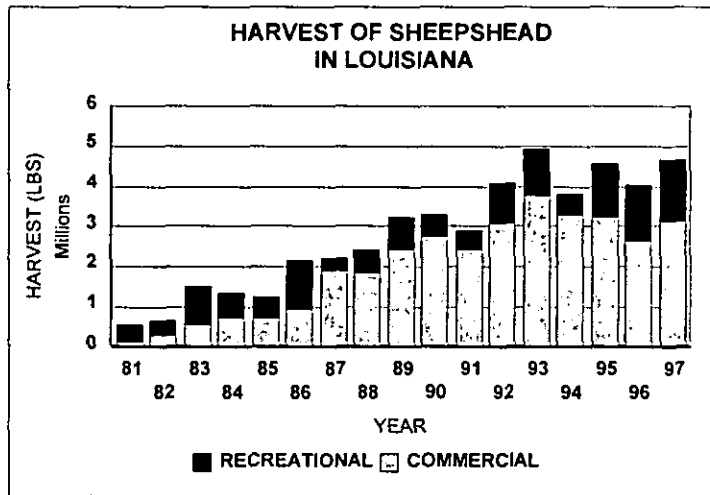
SHEEPSHEAD
SUMMARY OF CHANGES FROM 1998 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 1998 assessment conducted for Sheepshead.

- There are no substantive changes in methods from the 1998 assessment.
- No new biological information was available for the species, so the biological profile document is unchanged from last year.

1999 DOCUMENT HIGHLIGHTS

- 1997 combined commercial and recreational harvest of 4,675,087 pounds is the second highest harvest for the years examined.
- The results of YPR analysis indicate that if $M=0.2$ (the most conservative value within the range of estimates), the fishery prior to existing regulations was operating at approximately $F_{0.1}$ and well below F_{MAX} , with yield of 76% to 86% of maximum, and SPR at 40% to 50%. An M of 0.3 (the highest value examined) would indicate a more lightly fished stock with yield being 47% to 66% of maximum and with SPR being 58% to 71%.



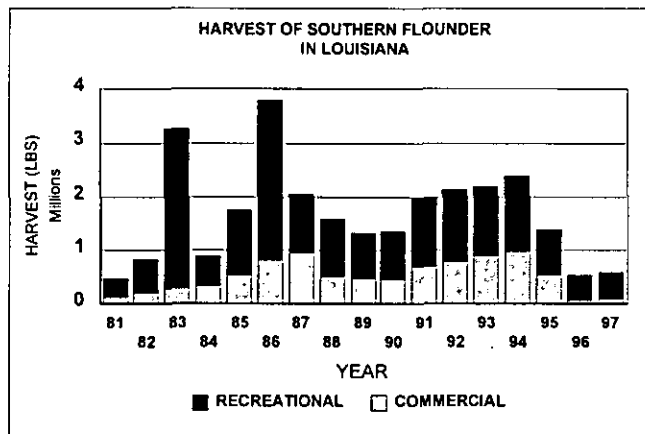
SOUTHERN FLOUNDER SUMMARY OF CHANGES FROM 1998 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 1998 assessment conducted for southern flounder.

- There are no substantive changes in methods from the 1998 assessment.
- No new biological information was available for the species, so the biological profile document is unchanged from last year.

1999 DOCUMENT HIGHLIGHTS

- 1997 combined commercial and recreational harvest of 582,690 pounds is the third lowest harvest for the years examined.
- The results of YPR analysis indicate that if $M=0.5$ (the most conservative value within the range of estimates), the fishery prior to existing regulations was operating between $F_{0.1}$ and F_{MAX} , with yields of 93% to 94% of maximum and SPR at 27% to 28%. An M of 0.8 (the highest value within the range examined) would produce yields of 65% to 67% of maximum with SPR at 51% to 52%.
- Regulations implemented since 1995 have significantly reduced harvest and have likely reduced fishing mortality rates from those currently estimated. SPRs that will result from current regulations will likely be above 30%.



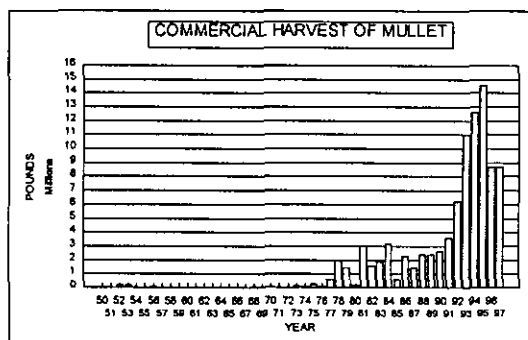
STRIPED MULLET SUMMARY OF CHANGES FROM 1998 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 1998 assessment conducted for striped mullet.

- The age-length key used last year included some fishery-independent samples from the LSU database, along with the fishery-dependent samples. Those samples were removed from this year's assessment, so that the age-length key is composed only of fishery-dependent samples from LSU and DWF databases. The result was an age-length key that should be a better representation of the ages of fish actually harvested by the fishery.
- Examination of the age-length key and length-frequency of the commercial catch indicated substantial variability in both variables across the state. In order to reduce mis-assignment of ages, only the ages and lengths obtained from fishery-dependent samples east of 90° W Longitude were included in this assessment. That area provides a substantial majority of the total commercial landings from the State.
- Selectivities were re-calculated based on the new age-length key. The age at full recruitment, and the relative selectivities are different from last year's report.

1999 DOCUMENT HIGHLIGHTS

- 1997 commercial landings of 8.7 million lbs., very similar to 1996.
- Estimates of Spawning Potential Ratio (SPR) are somewhat different from last year. Due to changes in technique listed above, the 1999 estimates of SPR and Yield Per Recruit (YPR) are more representative of the effects of fishing on that portion of mullet stocks east of 90°W longitude than estimates provided in the past, and underestimates the effects of fishing on the Louisiana mullet stock as a whole. Ranges are as follows, compared to last year's report:



	1998 SPR	1999 SPR
Natural Mortality Estimate	Estimate	Estimate
M=0.3	34.97%	31.17%
M=0.4	45.85%	41.32%
M=0.5	56.47%	51.42%
M=0.6	66.17%	60.86%

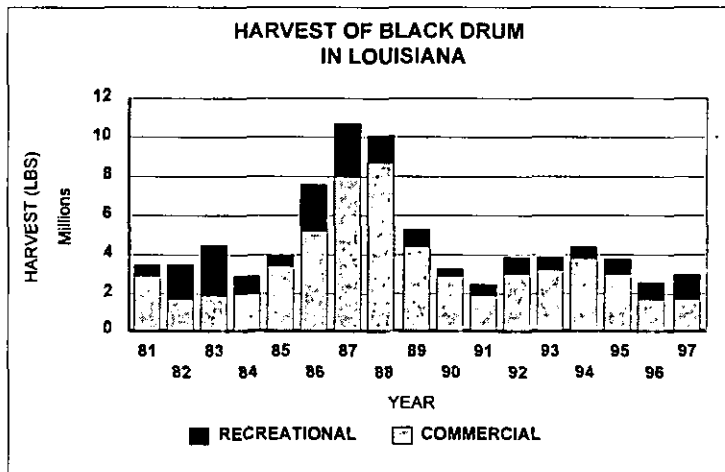
BLACK DRUM
SUMMARY OF CHANGES FROM 1998 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 1998 assessment conducted for black drum.

- There are no substantive changes in methods from the 1998 assessment.

1999 DOCUMENT HIGHLIGHTS

- 1997 combined commercial and recreational harvest of 3,014,575 pounds is the fourth lowest harvest for the years examined.
- The results of YPR analysis indicate that if $M=0.1$ (the most conservative value within the range of estimates), the fishery prior to existing regulations (Act 1316) was operating above $F_{0.1}$ and below F_{MAX} with yield of 92% of maximum, and SPR at 42%.



An M of 0.15 or 0.2 would indicate a more lightly fished stock with yield being 67% to 45% of maximum and with SPR being 56% to 67% respectively.

SHEEPSHEAD 5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR), Spawning Potential Ratio (SPR) and catch curve analyses to estimate the impact of fishing pressure on potential yield and the spawning potential of the sheepshead stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch-curve analysis estimates disappearance rates (Z') from the fishery based on the relative abundance of each age class in the harvest. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female sheepshead are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Growth

Von Bertalanffy growth parameters developed by Wilson et al. (1988) from fish harvested in Louisiana were used to calculate length and weight at age for female sheepshead. The equations are as follows:

$$\text{Female } L_t = 446(1 - e^{-0.367(t+1.025)})$$

$$\text{Female } W_t = 2556(1 - e^{-0.220(t+3.231)})^3$$

where, L_t = length at age t , W_t = weight at age t and t = age in years. Age at length is calculated as:

$$t = 1.025 + \ln(1 - L_t/446)/-0.367$$

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated, as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously. No direct measure of natural mortality for sheepshead is available; therefore, several established estimation procedures were used

to derive an estimate. The procedures are presented below and are taken from Sparre and Venema (1992).

Pauly (1980) provides a method of estimating natural mortality from a set of parameters including the asymptotic length and growth rate of the fish, and the average water temperature of the environment. The growth parameters from the von Bertalanffy growth equation described in Section 5.1 and the mean annual water temperature, derived from readings from a set of four constant recorders located throughout the Barataria Bay system, were used in the calculation. The mean water temperature was 22.7°C for the period 1989 - 1992 (pers. comm., M. Kasprzak, 4/13/92). These values were incorporated into the length-based function of Pauly (1980):

$$\ln(M) = -0.0152 - 0.279 * \ln(L_{\infty}) + 0.6543 * \ln(K) + 0.463 * \ln(T)$$

where, $\ln(M)$ = natural log of natural mortality, $\ln(L_{\infty})$ = natural log of the asymptotic length, $\ln(K)$ = natural log of the growth coefficient and $\ln(T)$ = natural log of the mean annual temperature in degrees Celsius.

Use of Louisiana data on growth and water temperature applied to Pauly's function results in a natural mortality estimate of $M=0.78$.

Alagaraja (1984) and Hoenig (1983) provide methods of estimating M based on the fishes lifespan or longevity, and with the assumption that $M=Z$. Longevity is also difficult to determine for exploited fish stocks, since the age distribution is usually truncated by fishing, but these methods are as useful as any in providing provisional estimates of natural mortality. The functions described by Alagaraja (1984) are:

$$\begin{aligned} M1\% &= -\ln(0.01)/T_m \\ M0.1\% &= -\ln(0.001)/T_m \end{aligned}$$

where, $M1\%$ and $M0.1\%$ are the natural mortality rates corresponding to 99% and 99.9% mortality, respectively, given a fishes lifespan (T_m) in years. Sheepshead in Louisiana have been aged to 20-years-old (Wilson et al. 1988). If it is assumed that 99% or 99.9% of the fish die by age 20 then the corresponding natural mortality rates for $M1\%$ and $M0.1\%$ would be 0.2 and 0.35 respectively.

The function described by Hoenig(1983) is:

$$\ln(Z) = 1.46 - 1.01 * \ln(T_m)$$

where, when $M=Z$, longevity (T_m) can be defined as the maximum survival age. If we assume that the maximum age of sheepshead has been truncated due to fishing from 25 to 20 years, the resulting estimate of natural mortality, given $T_m=25$, would be 0.2.

Another method of estimating M is described by Rikhter and Efanov (1976) and utilizes population age at sexual maturity. The function is:

$$M = 1.521 / (Tm50\%^{0.720}) - 0.155$$

where, Tm50% is the age at which 50% of the population is mature. Age 2 is assumed the age at 50% maturity for the sheepshead population (Wilson et al. 1988) resulting in an M of 0.77.

In summary, the estimated rates of natural mortality for sheepshead in Louisiana using a variety of estimation procedures are as follow:

Pauly (1980)	0.40
Alagaraja (1984)	0.20 and 0.35
Hoenig (1983)	0.20
Rikhter and Efanov (1976)	0.77

5.3 Disappearance Rates and Fishing Mortality

The disappearance rate (Z') from the fishery comprises the total mortality (natural + fishing) and some unknown rate of decreasing availability of the fish to the fishery. If the unknown rate of availability is small or nonexistent, then the disappearance rate will be a reasonable estimate of total mortality. However, if a large portion of the disappearance rate is due to fish not being available to the fishery, then assuming $Z' = Z$ will overestimate the impact of fishing.

We estimated rates of disappearance using data from two sources. The first source is the commercial data collected through the Trip Interview Program (TIP) for 1994-1996 and the second, data from the recreational fishery (NMFS Marine Recreational Fishery Statistics Survey 1994-1996). Fish were aged by using the growth equation presented in Section 5.1. Fish with lengths greater than the asymptotic length were not used in developing catch-at-age and therefore not used in estimating disappearance rates. The elimination of these fish reduces the number of large fish that are typically older fish used in estimating disappearance and produces a more conservative estimate. To calculate disappearance rates, we regressed the natural log of the catch-per-unit-effort against age, beginning with the age at full recruitment to the fishery. This method assumes that recruitment is constant and the fishery is in equilibrium. Disappearance rates were calculated from the commercial and recreational data by year where length frequency data was available. The calculated disappearance rates ranged from 0.45 to 0.60 (Table 5.1 and Figures 5.1A-D and 5.2A-D).

Catch-at-age data from the commercial and recreational fishery in 1995 was used to derive age-specific selectivities to be used in yield-per-recruit analysis. The method presented in Sparre and Venema (1992) was used to develop selectivities. This method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed

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catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. This selection ogive is then regressed in the equation:

$$\ln(1/S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t , and $T1$ and $T2$ are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age the following equation is used.

$$S_t (\text{estimate}) = 1 / (1 + \exp(T1 - T2 * t))$$

Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Selectivities are as follows:

age 0 = 0
 age 1 = 0.0011
 age 2 = 0.0271
 age 3 = 0.3785
 ages 4 and older = 1.

5.4 Yield-per-Recruit

Yield-per-recruit and SPR analysis provides basic information about the dynamics of a fish stock by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, sexual maturity described in Section 5.2 and the age-specific selectivities described in Section 5.3 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates were not available, therefore; mean weight at age was used in the estimation of spawning potential. Natural mortality rates of 0.2 and 0.3 were used in the analysis because they are on the lower end of the range of estimates and would provide the most conservative results. These rates are also used to describe the sensitivity of M on yield and spawning potential. The results are presented in Table 5.2, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F from the disappearance rates calculated in Section 5.3.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment would be expected to be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended, based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6% SPR. These authors recommended an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks they examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for sheepshead in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, sheepshead, southern flounder, and striped mullet appears to be adequate to maintain the sheepshead stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993). Some researchers have speculated that overharvest of some stocks may lead to their replacement in the ecosystem by other, often less preferred, stocks. The frequency of such replacements is unknown, and the cause of shifts in species predominance in an ecosystem are difficult to ascertain, even after the fact. Such a shift has been reported in the Georges Bank area, where prolonged, intense harvest of cod and haddock has been implicated in gradual increases in skate and spiny dogfish populations (National Oceanic and Atmospheric Administration 1993).

5.6 Status of the Stock

Sheepshead were lightly exploited until the early to mid-1980s when commercial harvest began to increase (Figure 5.3). Commercial landings have gone from 0.2 million pounds in the early 1980s to 2.4 - 3.7 million pounds in the 1990s. Landings have declined in the last five years from a high of 3.7 million pounds in 1993 to 2.6 million pounds in 1996. Harvest from the recreational fishery has remained stable, between 0.4 and 1.5 million pounds, for the years examined (1981-1997), and were equal to those of the commercial fishery until 1987 when the commercial fishery began to expand (Figure 5.4). Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had sheepshead in their catch. The results are presented in Figure 5.5 along with 95% confidence limits around the mean. The catch-per-unit-effort (CPUE) indices fluctuated with no indication of a long-term downward trend. The only statistically significant reduction in CPUE occurred in 1986 and 1987, being significantly lower than 1983, 1992, 1993 and 1997. Catch-per-effort data from the Departments, fishery-independent trammel net (750' - 1 5/8" inner, 6" outer wall) and small mesh bag seine (50' -1/4" delta mesh) samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\sum \ln (\text{catch} + 1) / N)) - 1$$

where, catch is the total number caught in each set and, N is the number of samples taken annually. Trammel net data were used for the period 1986-1998, and seine data were used for the period 1992-1998. Seine and trammel net CPUE fluctuated throughout the time period with no indication

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of a long-term downward trend; however, mean CPUE in seines for 1996 through 1998 were the lowest of the years examined and mean CPUE in trammel nets for 1998 was the second highest observed (Figure 5.6 and 5.7).

Rules for the harvest of sheepshead changed recently. Commercial harvest methods were changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted sheepshead harvest by the use of "suike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest sheepshead, and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and commercial harvesters must utilize other legal commercial gear to harvest sheepshead. This set of regulations had the effect of reducing the harvest of sheepshead by this segment of the commercial fishing industry.

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of current regulations described above. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery.

The results of YPR analysis indicate that if $M=0.2$ (the most conservative value within the range of estimates), the fishery prior to existing regulations was operating at approximately $F_{0.1}$ and well below F_{MAX} , with yield of 76% to 86% of maximum, and SPR at 40% to 50%. An M of 0.3 (the highest value examined) would indicate a more lightly fished stock with yield being 47% to 66% of maximum and with SPR being 58% to 71% (Table 5.2).

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment show wide variation. This variation reduces the reliability of the present assessment in providing an accurate prediction of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more precise estimate of natural mortality would assist in both of these problems.

Annual age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding of this relationship for sheepshead should be an ongoing priority.

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In the presence of changing regulations, fishery-dependent information is not a reliable source of data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

BIBLIOGRAPHY

- Alagaraja, D., 1984. Simple methods for estimation of parameters for assessing exploited fish stocks. *Indian J.fish.*, 31:177-208
- Gabriel, W.L. 1985. Spawning stock biomass per recruit analysis for seven Northwest Atlantic demersal finfish species. NMFS-NEFC. Woods Hole Lab. Ref. Doc. 85-04.
- Gabriel, W.L., W.J. Overholtz, S.A. Murawski and R.K. Mayo. 1984. Spawning stock biomass per recruit analysis for seven Northwest Atlantic demersal finfish species, Spring, 1984. NMFS-NEFC Woods Hole Lab. Ref. Doc. 84-23.
- Goodyear, C. P. 1989. Spawning stock biomass per recruit: the biological basis for a fisheries management tool. ICCAT Working Document SCRS/89/82. 10p.
- Hilborn, R. and C. J. Walters. 1992. Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty. Chapman and Hall, New York. 570 pp.
- Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. *Fish.Bull.NOAA/NMFS*, 81(4):898-903
- LDWF. 1991. A stock assessment for Louisiana spotted seatrout, *Cynoscion nebulosus*. LDWF Fishery Management Plan Series, Number 3 (Draft).
- Mace, P.M. and M.P. Sissenwine. 1993. How much spawning per recruit is enough? pp. 101-118 in S.J.Smith, J.J. Hunt and D. Rivard (eds.) Risk Evaluation and Biological Reference Points for Fisheries Management. *Can. Spec. Publ. Fish. Aq. Sci.* 120. 442pp.
- National Oceanic and Atmospheric Administration 1993. Our Living Oceans: Report on the Status of U.S. Living Marine Resources, 1993. NOAA Tech. Memo. NMFS-F/SPO-15. 156 pp.
- National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995. 1995 Report of the mackerel stock assessment panel. Miami Lab.Con. MIA- 94/95-30 March 1995
- Pauly, D. 1980. On the interrelationships between natural mortality, growth parameters, and mean environmental temperature in 175 fish stocks. *J. Cons. int. Explor. Mer* 39(2):175-192.
- Rikhter, V.A. and V.N. Efanov, 1976. On one of the approaches to estimation of natural mortality of fish populations. *ICNAF Res.Doc.*, 76/VI/8:12 p.

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- Sparre, P. and S.C. Venema 1992. Introduction to tropical fish stock assessment, Part 1-Manual. FAO Fish.Tech.Pap., (306) Rev.1:376 p.
- Vaughan, D.S. 1987. A stock assessment of the gulf menhaden, *Brevoortia patronus*, fishery. NOAA NMFS Tech. Rep. 58, 18 pp.
- Wilson, C. A. III, J. H. Render, and D. W. Beckman. 1988. The age structure and reproductive biology of sheepshead (*Archosargus probatocephalus*) landed in Louisiana. Final Report to Board of Regents, LSU-CFI. 49pp.

Table 5.1 Regression Output from the Estimation of Disappearance Rates

	COMMERCIAL		RECREATIONAL	
1994	Regression Output:		Regression Output:	
	Constant	6.6849685	Constant	12.73822
	Std Err of Y Est	0.2664827	Std Err of Y Est	0.3804634
	R Squared	0.9775528	R Squared	0.9494298
	No. of Observations	11	No. of Observations	9
	Degrees of Freedom	9	Degrees of Freedom	7
	X Coefficient(s)	-0.503017	X Coefficient(s)	-0.56308
	Std Err of Coef.	0.0254081	Std Err of Coef.	0.0491176
1995	Regression Output:		Regression Output:	
	Constant	7.9181322	Constant	13.820206
	Std Err of Y Est	1.79E-018	Std Err of Y Est	0.5661883
	R Squared	1	R Squared	0.8923711
	No. of Observations	12	No. of Observations	10
	Degrees of Freedom	10	Degrees of Freedom	8
	X Coefficient(s)	-0.457752	X Coefficient(s)	-0.507677
	Std Err of Coef.	1.5E-019	Std Err of Coef.	0.0623353
1996	Regression Output:		Regression Output:	
	Constant	7.4404283	Constant	13.999778
	Std Err of Y Est	0.4093899	Std Err of Y Est	0.7319099
	R Squared	0.9455771	R Squared	0.8251943
	No. of Observations	12	No. of Observations	8
	Degrees of Freedom	10	Degrees of Freedom	6
	X Coefficient(s)	-0.45126	X Coefficient(s)	-0.601048
	Std Err of Coef.	0.0342349	Std Err of Coef.	0.1129361
1997	Regression Output:		Regression Output:	
	Constant	8.4310628	Constant	13.847071
	Std Err of Y Est	0.6240547	Std Err of Y Est	0.6257462
	R Squared	0.8764515	R Squared	0.8578316
	No. of Observations	9	No. of Observations	9
	Degrees of Freedom	7	Degrees of Freedom	7
	X Coefficient(s)	-0.567729	X Coefficient(s)	-0.525014
	Std Err of Coef.	0.0805651	Std Err of Coef.	0.0807835

Table 5.2 - Results of Yield Per Recruit and SPR Analysis for Sheephead

M=0.2

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	2.0000	533.6046	1,076	20.57%	100.00%	Benchmarks
F0.1 =	0.2954	428.6514	2,435	46.58%	80.33%	
F20% =	2.1628	534.4601	1,046	20.00%	100.00%	
F30% =	0.7737	508.8837	1,569	30.00%	95.37%	
1994 Commercial	0.3030	431.7646	2,407	46.04%	80.91%	Estimates
1995 Commercial	0.2578	411.1336	2,587	49.49%	77.05%	
1996 Commercial	0.2513	407.6973	2,616	50.04%	76.40%	
1997 Commercial	0.3677	453.6238	2,203	42.14%	85.01%	
1994 Recreational	0.3631	452.2850	2,216	42.39%	84.76%	
1995 Recreational	0.3077	433.6023	2,391	45.73%	81.26%	
1996 Recreational	0.4010	462.3798	2,117	40.48%	86.65%	
1997 Recreational	0.3250	440.0445	2,332	44.60%	82.47%	

M=0.3

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	2.0000	364.2920	794	30.24%	100.00%	Benchmarks
F0.1 =	0.4611	283.7750	1,325	50.44%	77.90%	
F20% =	7.3629	393.5929	525	20.00%	100.00%	
F30% =	2.0502	365.0539	788	30.00%	100.00%	
1994 Commercial	0.2030	203.0874	1,741	66.30%	55.75%	Estimates
1995 Commercial	0.1578	176.5549	1,867	71.09%	48.47%	
1996 Commercial	0.1513	172.1976	1,887	71.86%	47.27%	
1997 Commercial	0.2677	232.0531	1,598	60.86%	63.70%	
1994 Recreational	0.2631	230.2482	1,607	61.21%	63.20%	
1995 Recreational	0.2077	205.4851	1,729	65.85%	56.41%	
1996 Recreational	0.3010	243.9743	1,538	58.55%	66.97%	
1997 Recreational	0.2250	213.9413	1,688	64.29%	58.73%	

Figure 5.1A - Disappearance Rate for Sheephead
Louisiana Commercial Fishery (1994)

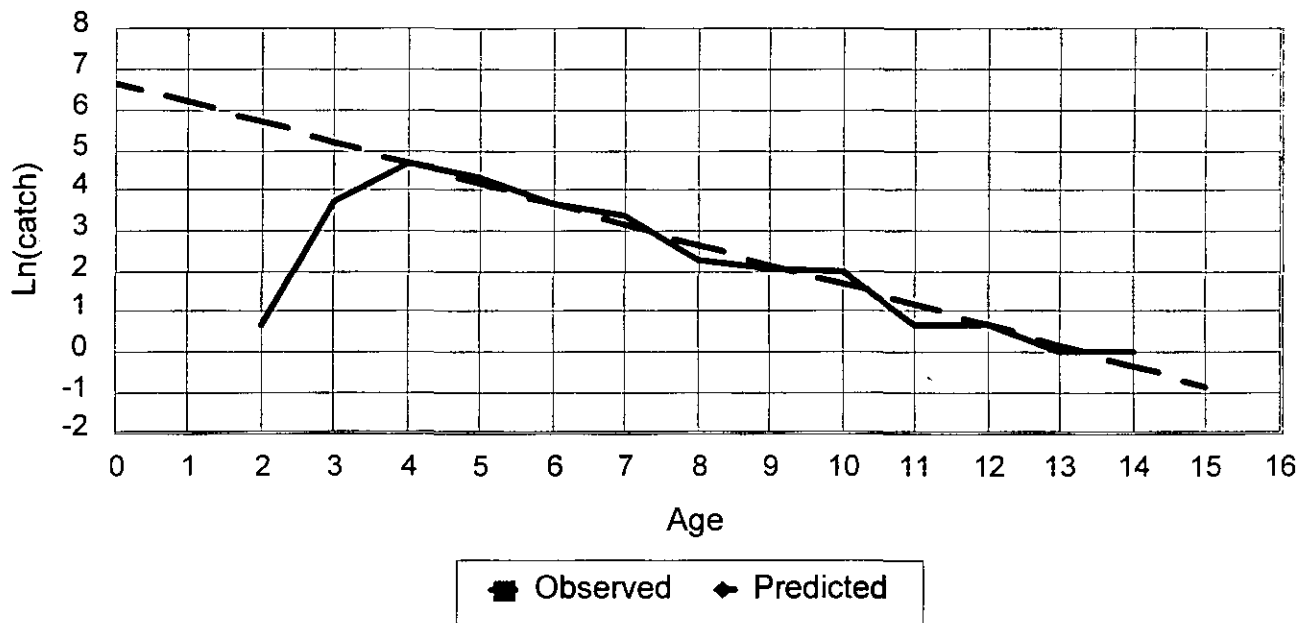


Figure 5.1B - Disappearance Rate for Sheephead
Louisiana Commercial Fishery (1995)

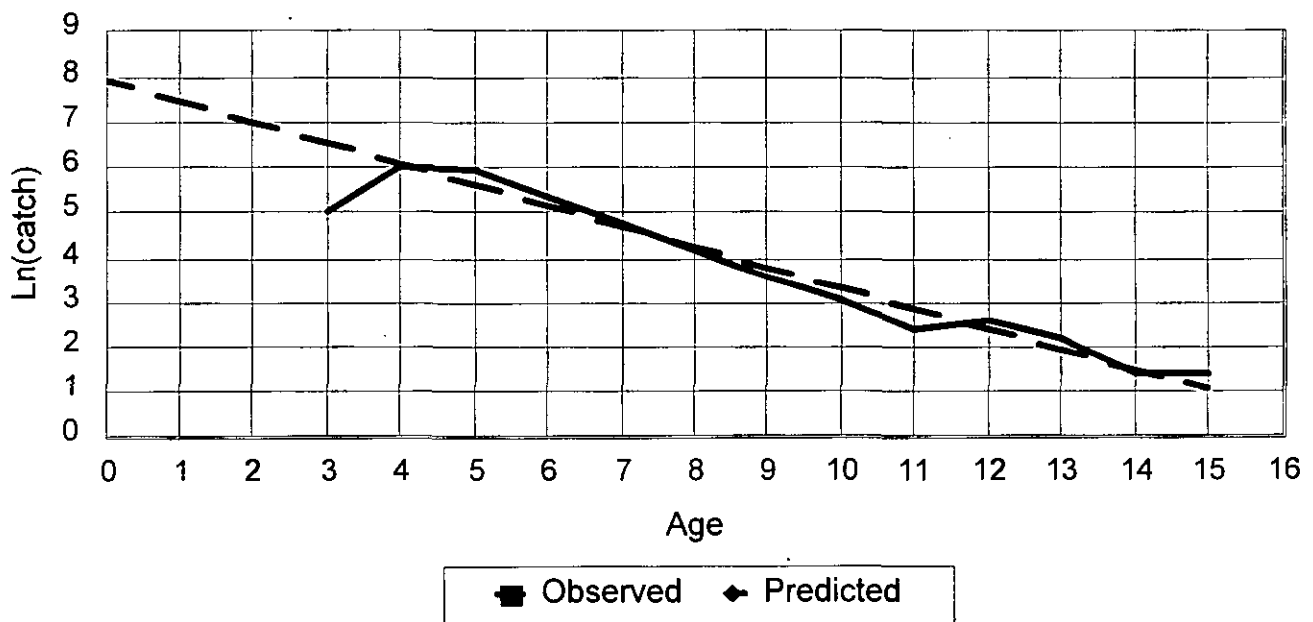


Figure 5.1C - Disappearance Rate for Sheephead
Louisiana Commercial Fishery (1996)

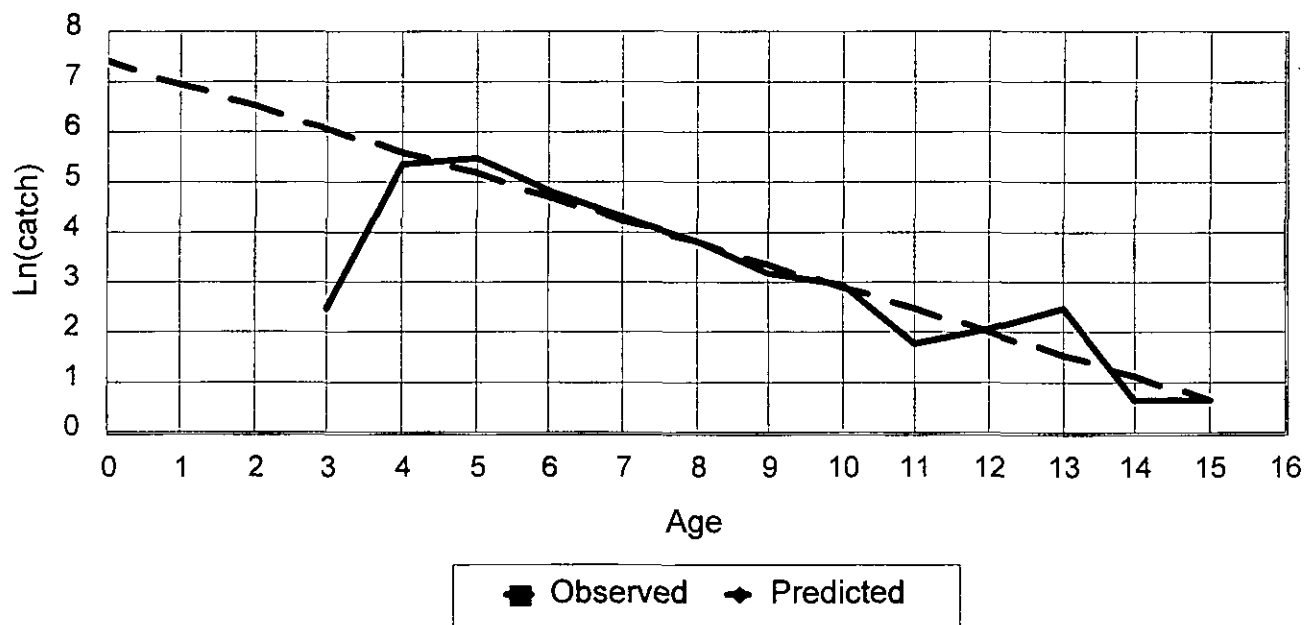


Figure 5.1D - Disappearance Rate for Sheephead
Louisiana Commercial Fishery (1997)

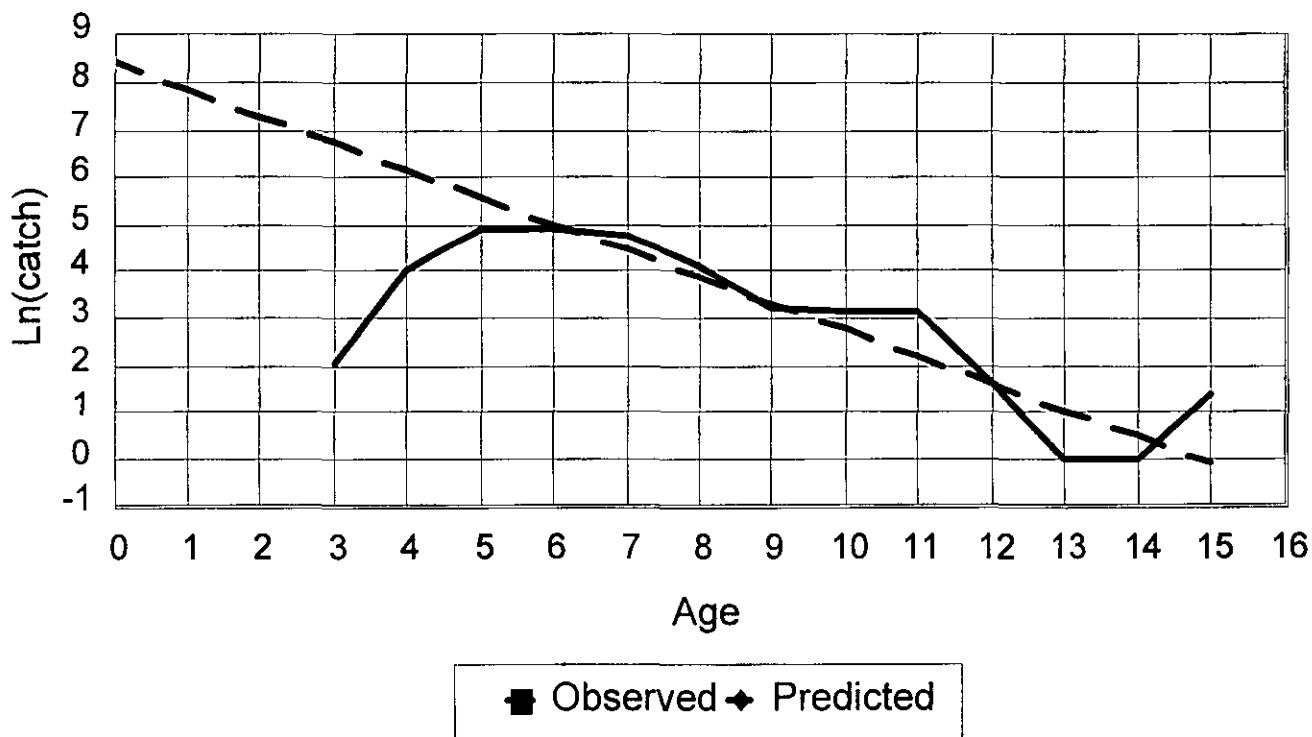


Figure 5.2A - Disappearance Rate for Sheephead
Louisiana Recreational Fishery (1994)

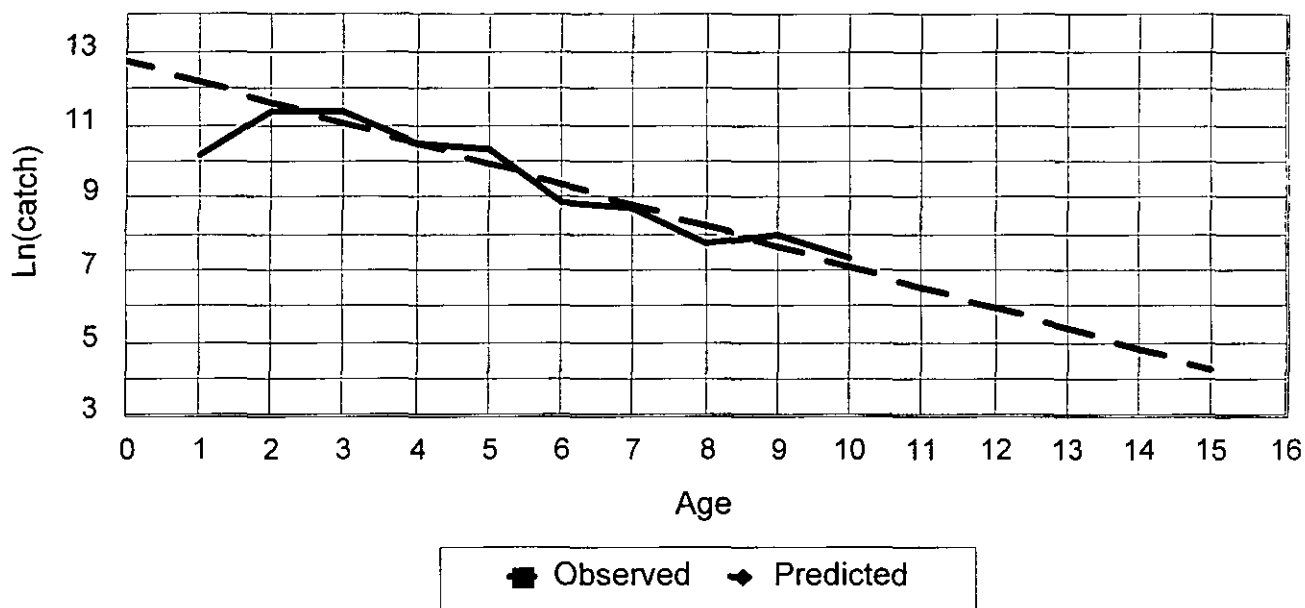


Figure 5.2B - Disappearance Rate for Sheephead
Louisiana Recreational Fishery (1995)

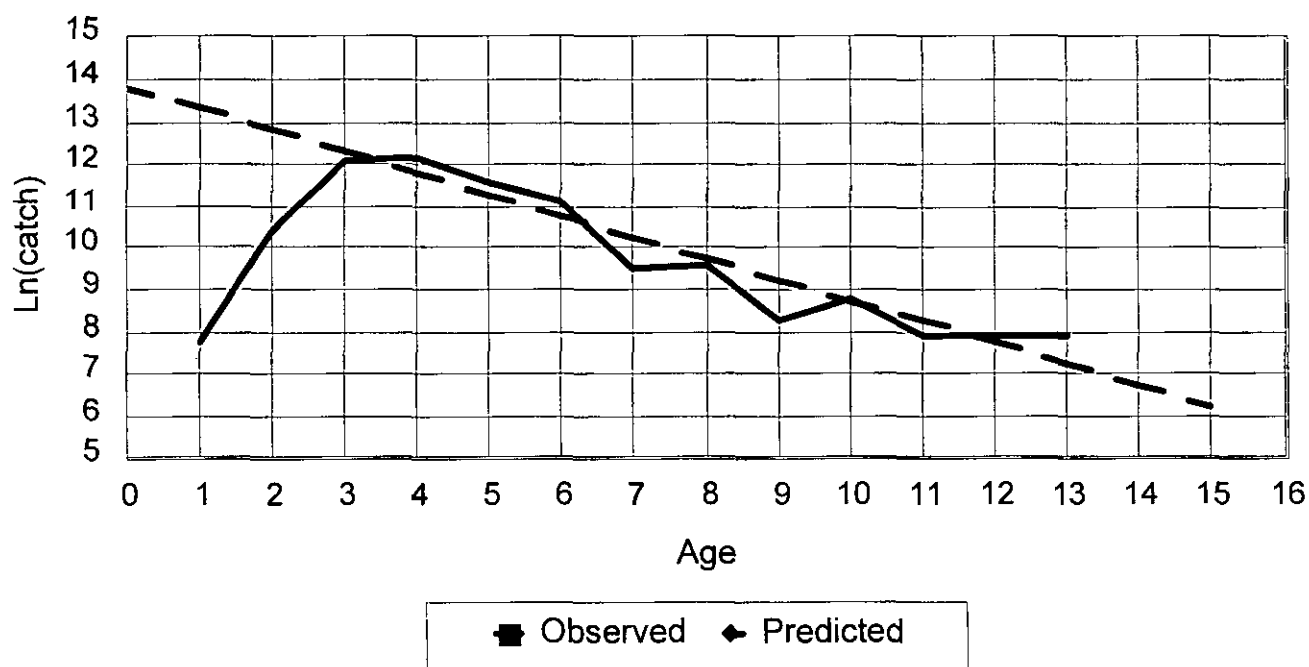


Figure 5.2C - Disappearance Rate for Sheephead
Louisiana Recreational Fishery (1996)

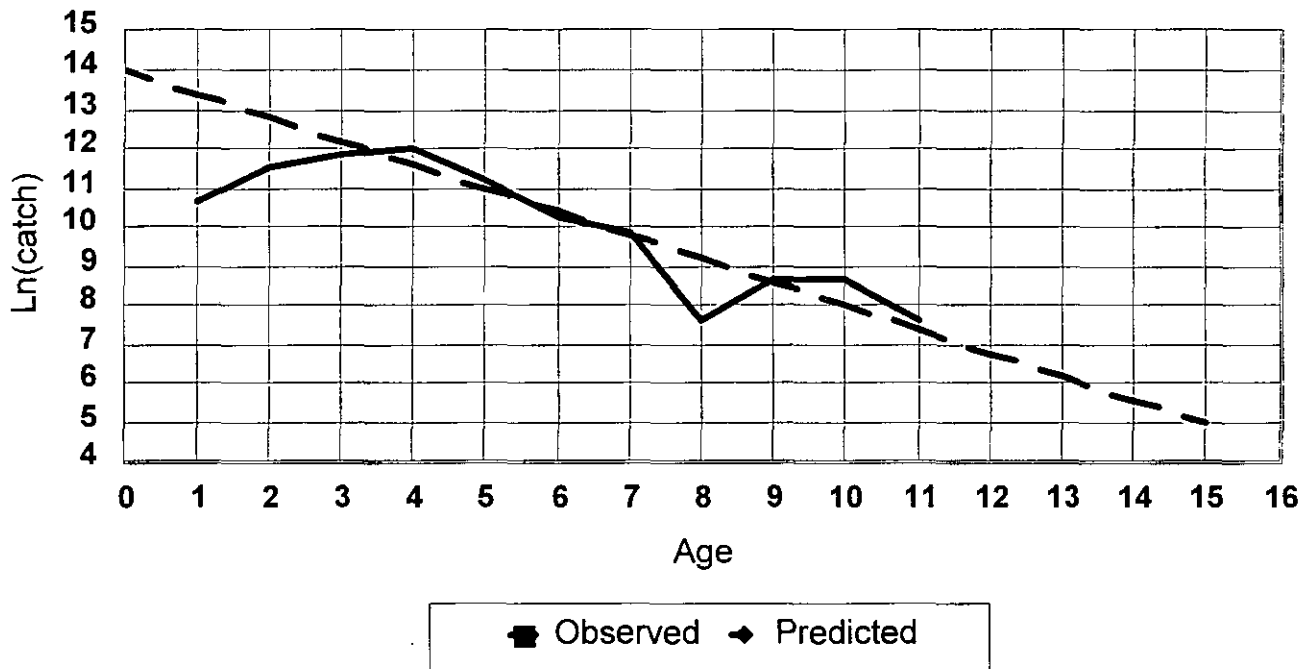


Figure 5.2D - Disappearance Rate for Sheephead
Louisiana Recreational Fishery (1997)

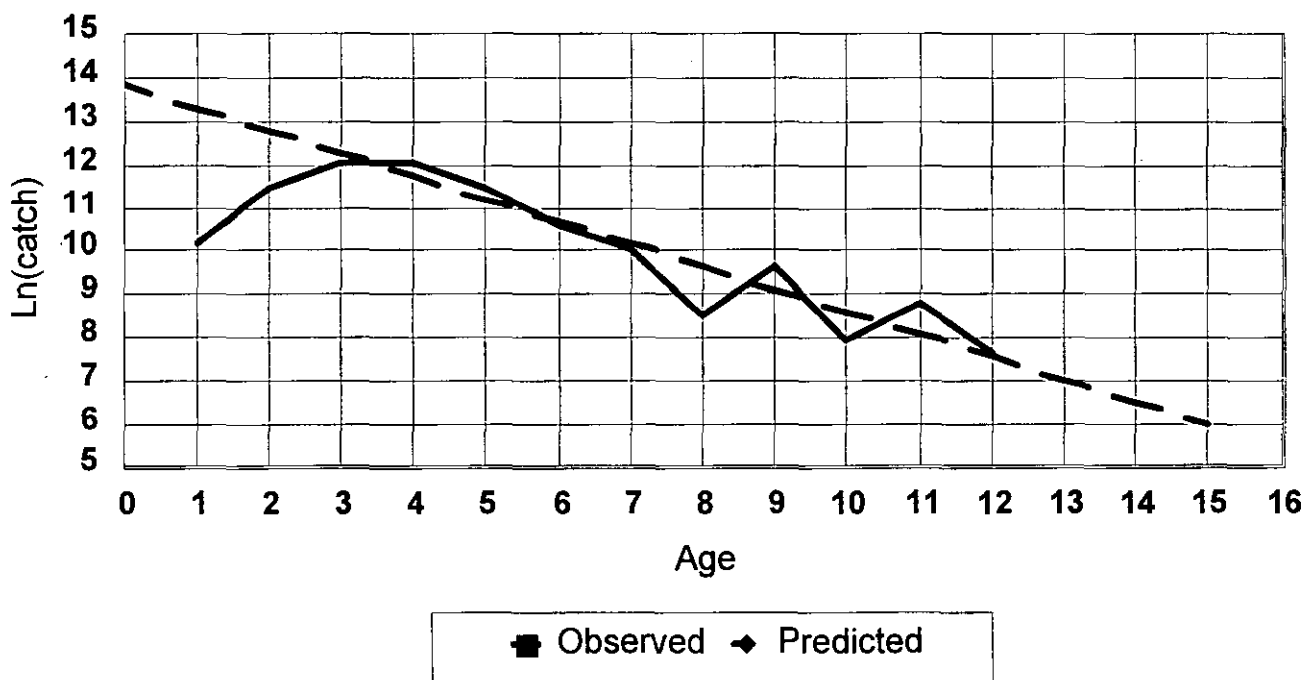


Figure 5.3 - Commercial Harvest of Sheephead
in Louisiana

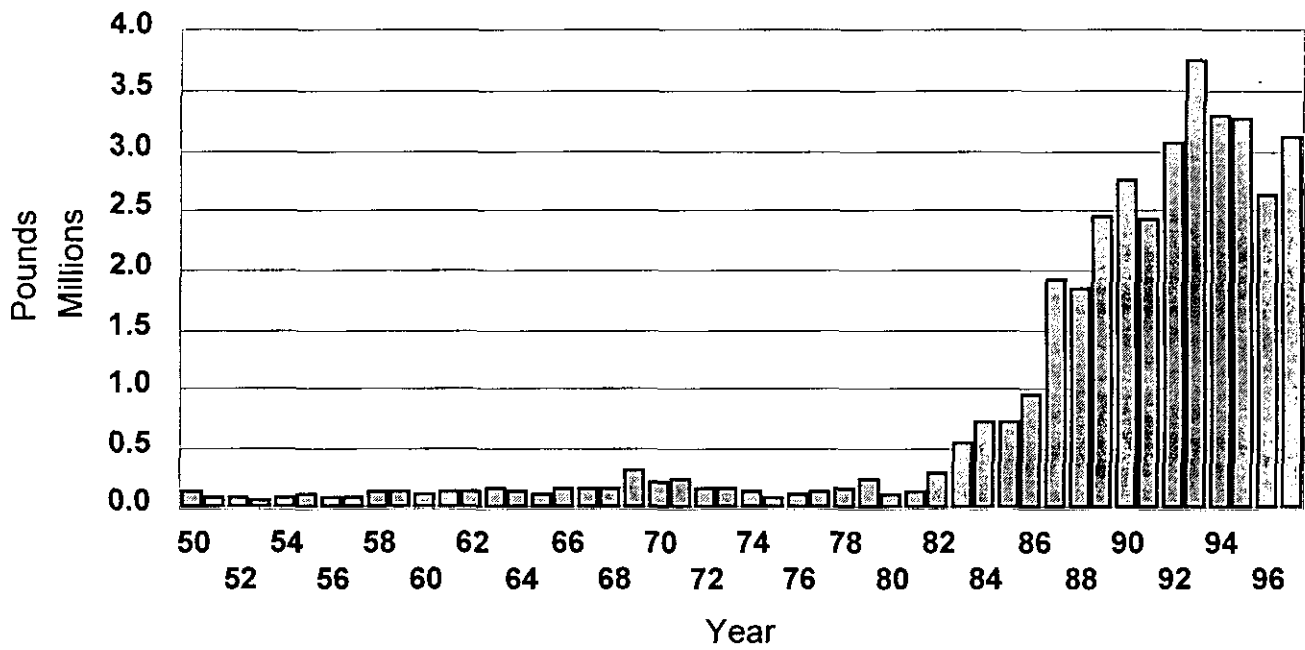


Figure 5.4 - Louisiana Commercial and Recreational Harvest
of Sheephead

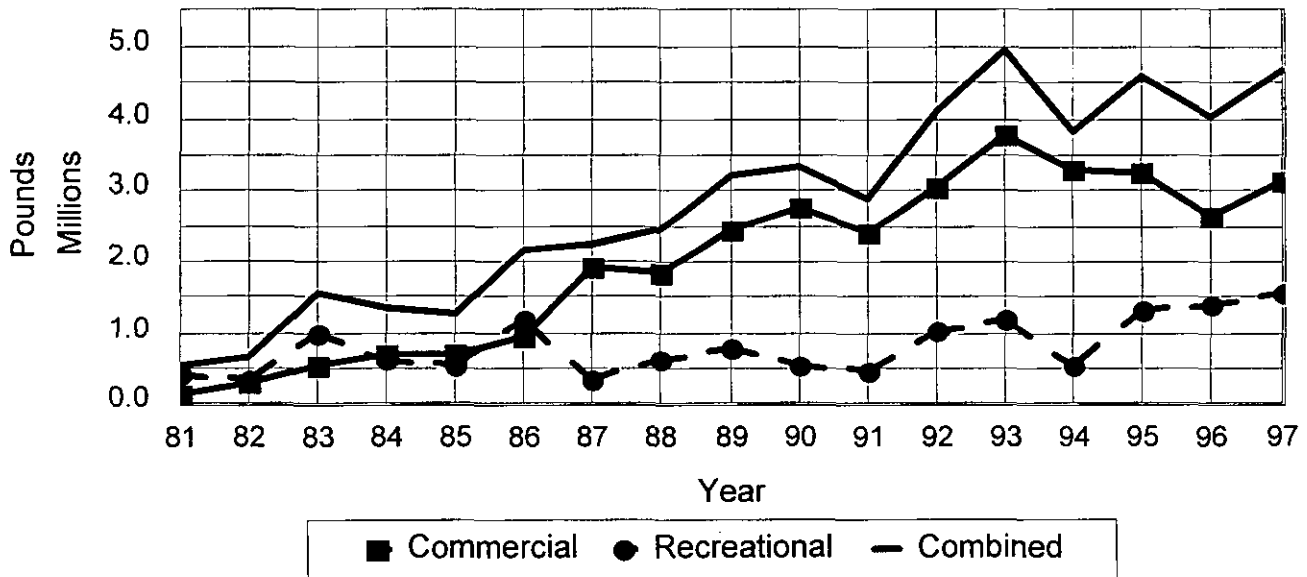


Figure 5.5 - Catch per Effort for Sheephead in Louisiana
NMFS Marine Recreational Fishery Statistics Survey

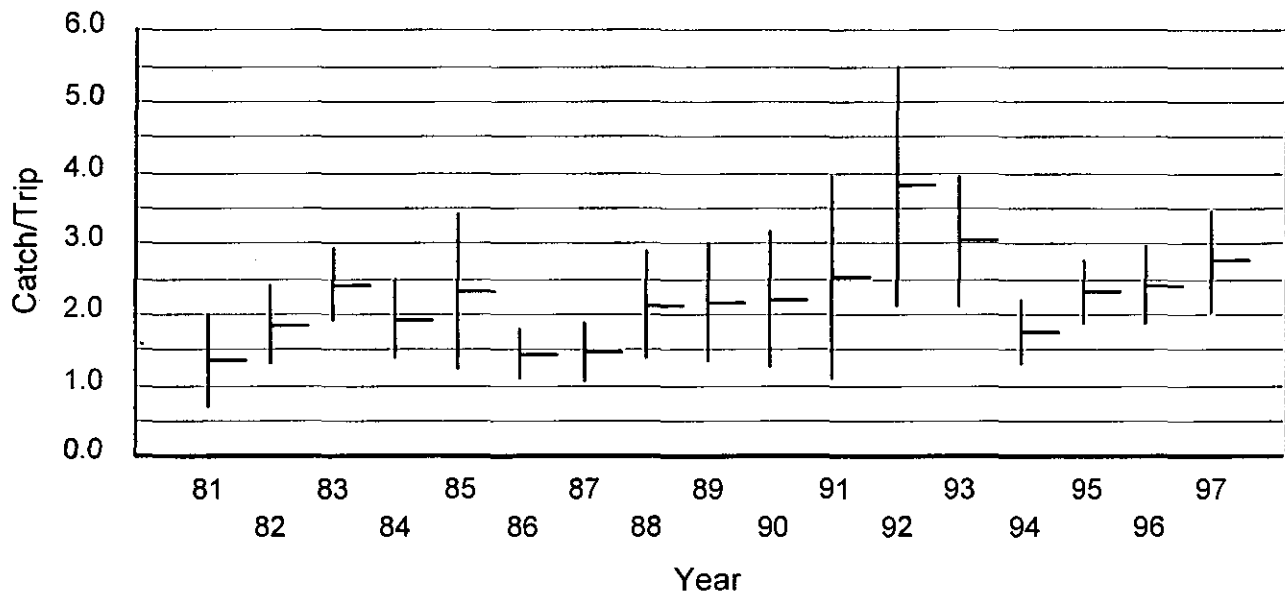


Figure 5.6 - Catch per Effort for Sheephead in Seines
Marine Fisheries Division, Monitoring Program

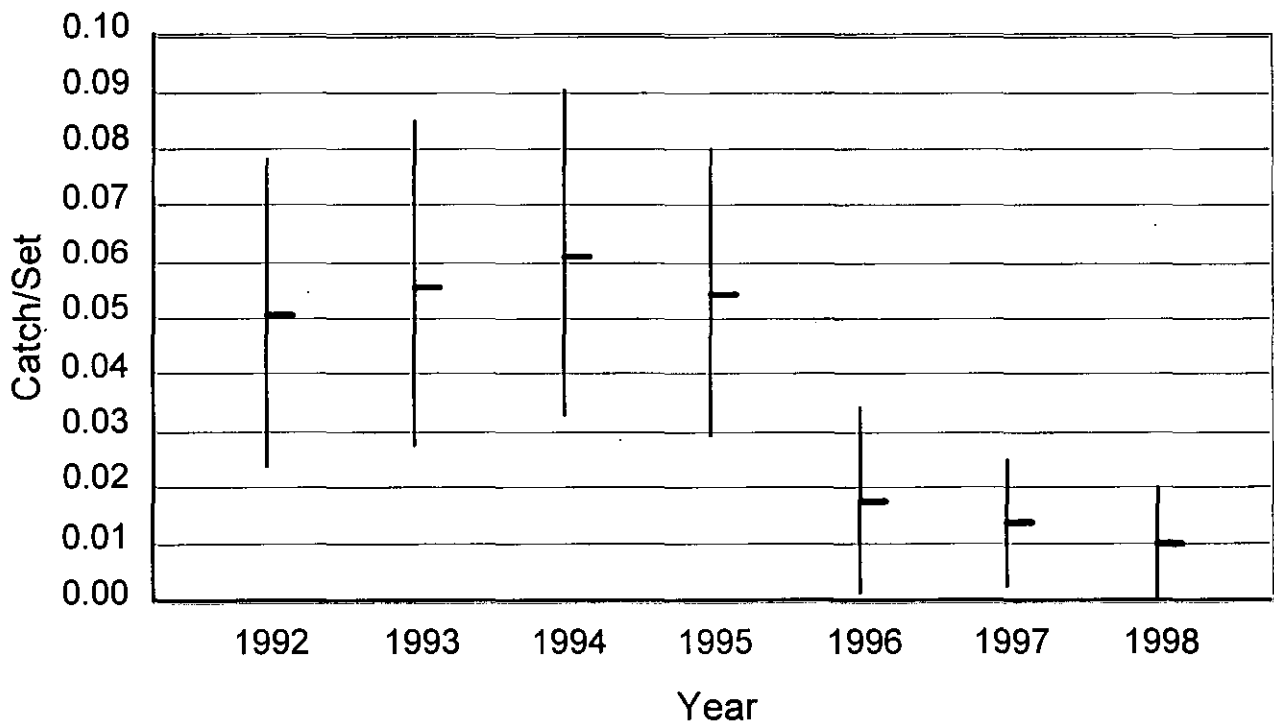
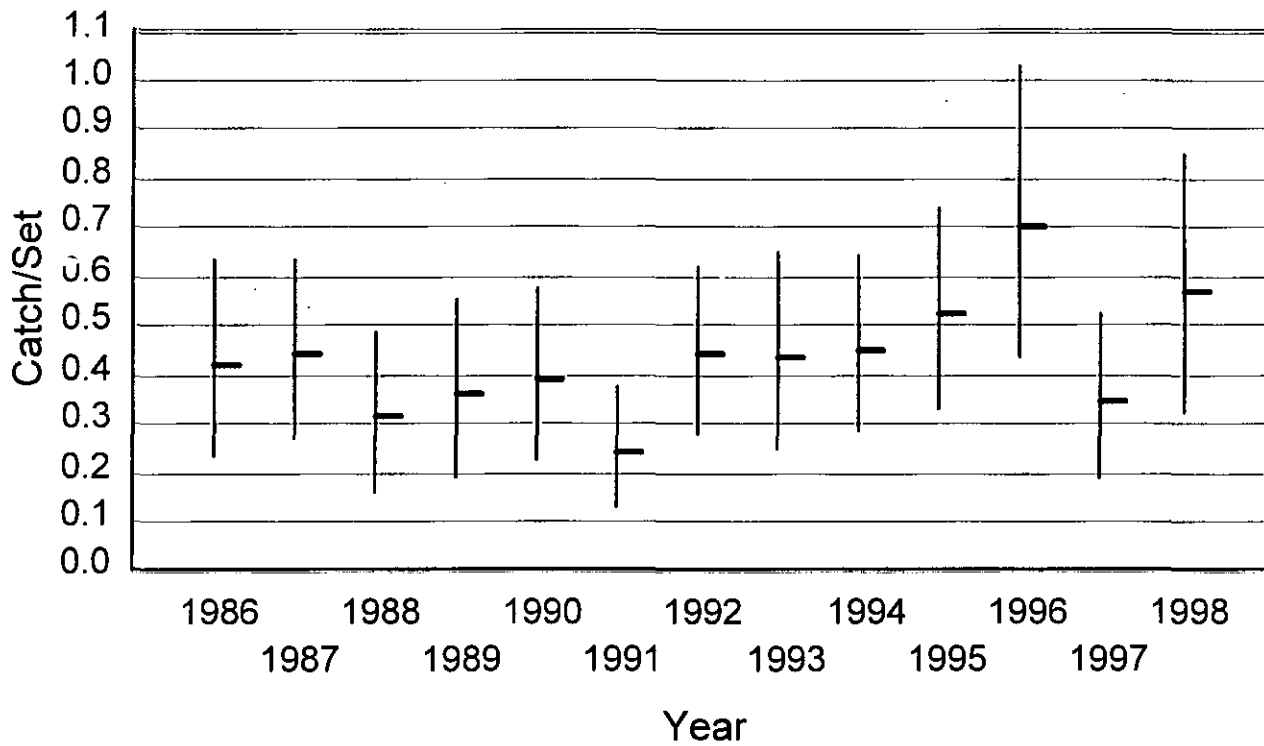


Figure 5.7 - Catch per Effort for Sheephead in Trammel Nets
Marine Fisheries Division, Monitoring Program



SOUTHERN FLOUNDER 5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR), Spawning Potential Ratio (SPR) and catch curve analyses to estimate the impact of fishing pressure on potential yield and the spawning potential of the southern flounder stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. Catch-curve analysis estimates disappearance rates (Z') from the fishery based on the relative abundance of each age class in the harvest. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female southern flounder are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Growth

Von Bertalanffy growth parameters were calculated for female southern flounder in Louisiana by using aged samples collected by Thompson (B. Thompson, Coastal Fisheries Institute, Louisiana State University, unpublished data) combined with juveniles assigned to age 0 (< 100 mm total length) by length frequency analysis from LDWF fishery-independent trawl samples. From the combined data, a three-parameter von Bertalanffy growth equation was estimated using nonlinear approximation (SAS, 1987). The equation is as follows:

$$\text{Female } L_t = 509(1 - e^{-0.8846(t-0.0954)})$$

where, L_t = length at age t . A plot of the data and predicted growth is provided in Figure 5.1. A length-weight regression for female southern flounder was derived using fish collected in Louisiana by Thompson (unpublished data) and the LDWF fishery-independent surveys. The resulting output of the SAS regression analysis is presented in Table 5.1. The length-weight regression used is as follows:

$$\log W = 3.18369 * \log L - 5.386116$$

where, W = body weight in grams, and L = total length in millimeters. A plot of the data and predicted weight-at-length is provided in Figure 5.2.

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously. No direct measure of natural mortality for southern flounder is available; therefore, several established estimation procedures were used to derive an estimate. The procedures are presented below and are taken from Sparre and Venema (1992).

Pauly (1980) provides a method of estimating natural mortality from a set of parameters including the asymptotic length and growth rate of the fish, and the average water temperature of the environment. The growth parameters from the von Bertalanffy growth equation described in Section 5.1 and the mean annual water temperature, derived from readings from a set of four constant recorders located throughout the Barataria Bay system, were used in the calculation. The mean water temperature was 22.7°C for the period 1989 - 1992 (pers. comm., M. Kasprzak, 4/13/92). These values were incorporated into the length-based function of Pauly (1980):

$$\ln(M) = -0.0152 - 0.279 * \ln(L_{\infty}) + 0.6543 * \ln(K) + 0.463 * \ln(T).$$

where, $\ln(M)$ = natural log of natural mortality, $\ln(L_{\infty})$ = natural log of the asymptotic length, $\ln(K)$ = natural log of the growth coefficient and $\ln(T)$ = natural log of the mean annual temperature in degrees Celsius.

Use of Louisiana data on growth and water temperature applied to Pauly's function results in a natural mortality estimate of $M=1.33$.

Alagaraja (1984) and Hoenig (1983) provide methods of estimating M based on the fish's lifespan or longevity with the assumption that $M=Z$. Longevity is also difficult to determine for exploited fish stocks, since the age distribution is usually truncated by fishing, but these methods are as useful as any in providing provisional estimates of natural mortality. The functions described by Alagaraja (1984) are:

$$\begin{aligned} M_{1\%} &= -\ln(0.01)/T_m \\ M_{0.1\%} &= -\ln(0.001)/T_m \end{aligned}$$

where, $M_{1\%}$ and $M_{0.1\%}$ are the natural mortality rates corresponding to 99% and 99.9% mortality, respectively, given a fish's lifespan (T_m) in years. Female southern flounder in Louisiana have been aged to 7-years-old (Thompson, personal communication). If it is assumed that 99% or 99.9% of the fish die by age 7 then corresponding natural mortality rates for $M_{1\%}$ and $M_{0.1\%}$ would be 0.66 and 0.99 respectively.

The function described by Hoenig(1983) is :

$$\ln(Z) = 1.46 - 1.01 * \ln(T_m)$$

where, when $M=Z$, longevity (T_m) can be defined as the maximum survival age. If we assume that the maximum age of southern flounder has been truncated due to fishing from 9 to 7 years, the resulting estimate of natural mortality, given $T_m=9$, would be 0.47. However, if our assumption is incorrect and the maximum age is 7 years then the estimate of natural mortality would be 0.60.

Another method of estimating M is described by Rikhter and Efanov (1976) and utilizes population age at sexual maturity. The function is:

$$M = 1.521/(T_{m50\%}^{0.720}) - 0.155$$

where, $T_{m50\%}$ is the age at which 50% of the population is mature. Age 1 is assumed to be the age at 50% maturity, based on the length at sexual maturity found by several researchers (Adkins et al. 1996), and results in an M of 1.37. However, if 50% maturity occurs at age 2 rather than age 1, the estimate of natural mortality would be 0.77.

In summary, the estimated rates of natural mortality for southern flounder in Louisiana using a variety of estimation procedures are as follow:

Pauly (1980)	0.68
Alagaraja (1984)	0.66 and 0.99
Hoenig (1983)	
1) Longevity 9 years	0.47
2) Longevity 7 years	0.60
Rikhter and Efanov (1976)	
1) 50% maturity age 1	1.37
2) 50% maturity age 2	0.77

5.3 Disappearance Rates and Fishing Mortality

The disappearance rate (Z') from the fishery comprises total mortality (natural + fishing) and some unknown rate of decreasing availability of the fish to the fishery. If the unknown rate of availability is small or nonexistent, then the disappearance rate will be a reasonable estimate of total mortality. However, if a large portion of the disappearance rate is due to fish not being available to the fishery, then assuming $Z'=Z$ will overestimate the impact of fishing.

We estimated rates of disappearance using data from two sources. The first source is the commercial data collected through the Trip Interview Program (TIP) for 1994-1996, and the second, data from the recreational fishery (NMFS Marine Recreational Fishery Statistics Survey 1994-1996). The data from both of the surveys did not distinguish between sexes, therefore we assumed for this assessment that all fish sampled were female. Fish were aged by using an age-length key developed

from otolith aging of fish by Thompson (unpublished data) and LDWF's ongoing aging study. Eleven hundred and seventy nine aged fish were used in the development of the age-length key (Table 5.2). To calculate disappearance rates, we regressed the natural log of the catch-per-unit-effort against age, beginning with the age at full recruitment to the fishery. This method assumes that recruitment is constant and the fishery is in equilibrium. Disappearance rates were calculated from the commercial and recreational data by year where length frequency data was available. The calculated disappearance rates ranged from 1.1 to 1.3 (Table 5.3 and Figures 5.3A-C and 5.4A-C).

Catch-at-age from the commercial and recreational fishery in 1995 was used to derive age-specific selectivities to be used in yield-per-recruit analysis. The method presented in Sparre and Venema (1992) was used to develop selectivities. This method uses a linearized catch curve to determine the selectivity of fish not yet fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the probability of capture or selectivity of the fishery at age. This selection ogive is then regressed in the equation:

$$\ln(1/S_t - 1) = T1 - T2 * t$$

where, S_t = the selectivity at age t , and $T1$ and $T2$ are constants corresponding to the intercept and slope of the regression. To develop theoretical or estimated selectivities at age the following equation is used:

$$S_t (\text{estimate}) = 1 / (1 + \exp(T1 - T2 * t))$$

Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for age at full recruitment and older, selectivities are assumed to be 1, or 100% selected. Selectivities are as follows:

$$\begin{aligned} \text{age } 0 &= 0.012 \\ \text{ages } 1 \text{ and older} &= 1. \end{aligned}$$

5.4 Yield per Recruit

Yield-per-recruit and SPR analysis provides basic information about the dynamics of a fish stock by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, sexual maturity described in Section 5.2 and the age-specific selectivities described in Section 5.3 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates were not available, therefore; mean weight at age was used in the estimation of spawning potential. Natural mortality rates of 0.5 to 0.8 by 0.1 were used in the analysis because they are on the lower end of the range of estimates and would provide the most conservative results. These rates are also used to describe the sensitivity of M on yield and spawning potential. The results are presented in Table 5.4, which contains estimates of

F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and annual estimates of F from the disappearance rates calculated in Section 5.3.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment will be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6%. These authors recommended that an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for southern flounder in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, southern flounder, sheepshead,

and striped mullet appears to be adequate to maintain the southern flounder stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993). Some researchers have speculated that overharvest of some stocks may lead to their replacement in the ecosystem by other, often less preferred, stocks. The frequency of such replacements is unknown, and the cause of shifts in species predominance in an ecosystem are difficult to ascertain, even after the fact. Such a shift has been reported in the Georges Bank area, where prolonged, intense harvest of cod and haddock has been implicated in gradual increases in skate and spiny dogfish populations (National Oceanic and Atmospheric Administration 1993).

5.6 Status of the Stock

Rules for the harvest of southern flounder have changed substantially over the last three years. Commercial harvest methods were changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted flounder harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest flounder, and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and commercial harvesters must utilize other legal commercial gear to harvest flounder. This set of regulations had the effect of substantially reducing the harvest of flounder by this segment of the commercial fishing industry.

A second set of regulations became effective on May 1, 1996. Recreational harvesters were restricted to a creel limit of ten (10) southern flounder, with one day's limit in possession. At the same time, the use of strike nets for the harvest of southern flounder was outlawed, and other commercial harvesters were limited to a possession limit of ten (10) fish per person aboard a commercial vessel. This set of regulations reduced the ability of some recreational harvesters to retain southern flounder, and also reduced the harvest potential of the commercial fishing industry.

In 1997, regulations were again changed by Acts 1163 and 1352 of the 1997 Regular Legislative Session. Recreational and commercial harvesters continued to have daily take limit of 10 fish, but were allowed that take limit for each day on the water. Additionally, commercial shrimping vessels are limited to 100 pounds of southern flounder per shrimping trip.

Commercial landings have fluctuated over the period 1950-1996 with the highest landings in the mid-1980s and mid-1990s at 0.94 and 0.97 million pounds, respectively (Figure 5.5). Regulatory measures implemented in 1995 and 1996 had much to do with the reduction in commercial harvest of 61,755 and 94,898 pounds in 1996 and 1997 respectively. Recreational landings were equal to or greater than those of the commercial fishery until 1991 when the commercial fishery began harvesting a greater percentage of the total harvest (Figure 5.6). As a result of the regulatory measures described above the recreational harvest was greater than the commercial harvest in 1996 and 1997. Harvest from the recreational fishery has fluctuated for the years examined (1981-1997), and has been relatively stable since 1988. Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had southern flounder in the catch. The means with 95% confidence limits are presented in Figure 5.7. The catch-per-effort (CPUE) indices seem to cycle over the years examined, with 1987 having the lowest mean cpue. Since 1990 cpue has shown a declining trend with 1997 being significantly lower than 1982, 1983, 1988, 1990 and 1991. Catch-per-effort data from the Departments, fishery-independent trammel net (750' - 1 5/8" inner, 6" outer wall) and 16-foot flat otter trawl samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\sum \ln (\text{catch} + 1) / N)) - 1$$

where, catch is the total number caught in each set and, N is the number of samples taken annually. Trammel net data were used for the period 1986-1998, and 16-foot trawl data were used for the period 1967- 1998. Trammel net samples are collected from October through March. In order to use the most recent data available to us in this report, trammel net CPUE was estimated for two periods (January-March and October-December). This allowed the use of 1998 data through December. CPUE estimates from trammel nets fluctuated without any indication of a downward trend (Figure 5.8A-C). The large amount of variation in January - March samples for 1987 is due to small sample size (Figure 5.8A). Standardized CPUE estimates presented in Figure 5.8C indicate better than average catches in the latter half of the years examined, with five of the last six years being above average. Trawl data was used to provide an index of young-of-the-year recruitment. The long-term database provide by 16-foot trawl data shows how CPUE cycles over time and represent natural fluctuations in recruitment. Whatever the cause of the cyclic nature of the indices, no evidence from the 16-foot trawl data indicates a long-term downward trend in CPUE for southern flounder (Figure 5.9).

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of current regulations described above. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery.

The results of YPR analysis indicate that if $M=0.5$ (the most conservative value within the range of estimates), the fishery prior to existing regulations was operating between $F_{0.1}$ and F_{MAX} , with yields of 93% to 94% of maximum and SPR at 27% to 28%. An M of 0.8 (the highest value within the range examined) would produce yields of 65% to 67% of maximum with SPR at 51% to 52% (Table 5.4).

Regulations implemented since 1995 have significantly reduced harvest and have likely reduced fishing mortality rates from those currently estimated. SPRs that will result from current regulations will likely be above 30%.

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment show wide variation. This variation reduces the reliability of the present assessment in providing an accurate prediction of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more precise estimate of natural mortality would assist in both of these problems.

Annual age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding of this relationship for southern flounder should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundances. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

BIBLIOGRAPHY

- Adkins, G., S. Hein, P. Meier 1996. A biological and fisheries profile for southern flounder (*Paralichthys lethostigma*) in Louisiana. La. Dept. of Wildlife and Fisheries, Office of Fisheries. Fisheries Management Plan Series No. 6, Pt. 1.
- Alagaraja, D., 1984. Simple methods for estimation of parameters for assessing exploited fish stocks. Indian J.fish., 31:177-208
- Gabriel, W.L. 1985. Spawning stock biomass per recruit analysis for seven Northwest Atlantic demersal finfish species. NMFS-NEFC. Woods Hole Lab. Ref. Doc. 85-04.
- Gabriel, W.L., W.J. Overholtz, S.A. Murawski and R.K. Mayo. 1984. Spawning stock biomass per recruit analysis for seven Northwest Atlantic demersal finfish species, Spring, 1984. NMFS-NEFC Woods Hole Lab. Ref. Doc. 84-23.
- Goodyear, C. P. 1989. Spawning stock biomass per recruit: the biological basis for a fisheries management tool. ICCAT Working Document SCRS/89/82. 10p.
- Hilborn, R. and C. J. Walters. 1992. Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty. Chapman and Hall, New York. 570 pp.
- Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fish.Bull.NOAA/NMFS, 81(4):898-903
- Louisiana Department of Wildlife and Fisheries. 1991. A stock assessment for Louisiana spotted seatrout, (*Cynoscion nebulosus*). LDWF Fishery Management Plan Series, Number 3 (Draft).
- Mace, P.M. and M.P. Sissenwine. 1993. How much spawning per recruit is enough? pp. 101-118 in S.J.Smith, J.J. Hunt and D. Rivard (eds.) Risk Evaluation and Biological Reference Points for Fisheries Management. Can. Spec. Publ. Fish. Aq. Sci. 120. 442pp.
- National Oceanic and Atmospheric Administration 1993. Our Living Oceans: Report on the Status of U.S. Living Marine Resources, 1993. NOAA Tech. Memo. NMFS-F/SPO-15. 156 pp.
- National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995. 1995 Report of the mackerel stock assessment panel. Miami Lab.Con. MIA- 94/95-30 March 1995
- Pauly, D. 1980. On the interrelationships between natural mortality, growth parameters, and mean environmental temperature in 175 fish stocks. J. Cons. int. Explor. Mer 39(2)175-192.

- Rikhter, V.A. and V.N. Efanov, 1976. On one of the approaches to estimation of natural mortality of fish populations. ICNAF Res.Doc., 76/VI/8:12 p.
- SAS, 1987. SAS/STAT guide for personal computers, Version 6 edition. SAS Inst., Cary, N.C. 1028 pp.
- Sparre, P. and S.C. Venema 1992. Introduction to tropical fish stock assessment, Part 1-Manual. FAO Fish.Tech.Pap., (306) Rev.1:376 p.
- Vaughan, D.S. 1987. A stock assessment of the gulf menhaden, (*Brevoortia patronus*), fishery. NOAA NMFS Tech. Rep. 58, 18 pp.

Table 5.1 - SAS output from length-weight regression analysis

The SAS System

Model: MODEL1

Dependent Variable: LOG_W

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	54.62048	54.62048	14726.405	0.0001
Error	966	3.58291	0.00371		
C Total	967	58.20339			
Root MSE		0.06090	R-square	0.9384	
Dep Mean		2.90704	Adj R-sq	0.9384	
C.V.		2.09497			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	-5.386116	0.06836746	-78.782	0.0001
LOG_L	1	3.183690	0.02623508	121.352	0.0001

Table 5.2 - Age-at-length distribution of fish used in age-length key development.

Length (inches)	AGE								Total
	0	1	2	3	4	5	6	7	
5		1							1
6									
7		1							1
8	6	4							10
9	2	10							12
10	12	17							29
11	10	21	3	2					36
12	5	40	8	2					55
13	8	57	8	3					76
14	4	94	29	1					128
15	1	139	38	5			1		184
16		122	48	7	1				178
17	1	87	53	14	3				158
18		64	45	13	2	3			127
19		34	33	7	5	2		1	82
20		10	16	2	6	1			35
21		10	15	8	5				38
22			3	4	1		1		9
23			5	2	3	1			12
24				3	1	2			6
25					1				1
26				1					1
Total	49	712	304	74	28	9	2	1	1,179

Table 5.3 Regression Output from the Estimation of Disappearance Rates

COMMERCIAL

1994

Regression Output:

Constant6.9376786

Std Err of Y Est0.1828934

RSquared0.995106

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.10206

Std Err of Coef.0.0345636

1995

Regression Output:

Constant7.7152163

Std Err of Y Est0.3272334

RSquared0.9883735

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.274968

Std Err of Coef.0.0618413

1996

Regression Output:

Constant5.2408874

Std Err of Y Est0.2943004

RSquared0.9898797

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.229961

Std Err of Coef.0.0556175

1997

Regression Output:

Constant3.1782834

Std Err of Y Est0.2483701

RSquared0.9815698

No. of Observations6

Degrees of Freedom4

X Coefficient(s)-0.866573

Std Err of Coef.0.0593718

RECREATIONAL

Regression Output:

Constant6.5849014

Std Err of Y Est0.2809178

RSquared0.9918464

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.309284

Std Err of Coef.0.0530885

Regression Output:

Constant6.0414293

Std Err of Y Est0.4842199

RSquared0.9748888

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.274948

Std Err of Coef.0.091509

Regression Output:

Constant6.1725039

Std Err of Y Est0.3403004

RSquared0.9879574

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.3025

Std Err of Coef.0.0643107

Regression Output:

Constant6.1094935

Std Err of Y Est0.5650944

RSquared0.9656242

No. of Observations7

Degrees of Freedom5

X Coefficient(s)-1.265623

Std Err of Coef.0.1067928

Table 5.4 Results of Yield per Recruit and SPR Analysis for Southern Flounder

M=0.5

	F Ratio	YPR	SPR	% SPR	% YPR	
F-max =	2.0000	0.6437	0.3218	11.70%	100.00%	Benchmarks
F0.1 =	0.5521	0.5600	1.0143	36.86%	87.00%	
F30% =	0.7207	0.5950	0.8256	30.00%	92.44%	
F20% =	1.1450	0.6302	0.5504	20.00%	97.90%	
1994 Commercial=	0.6000	0.5721	0.9535	34.65%	88.88%	Estimates
1995 Commercial=	0.7700	0.6020	0.7818	28.41%	93.52%	
1996 Commercial=	0.7300	0.5964	0.8170	29.69%	92.65%	
1997 Commercial=	0.3666	0.4867	1.3276	48.24%	75.61%	
1994 Recreational=	0.8000	0.6057	0.7571	27.51%	94.09%	
1995 Recreational=	0.7700	0.6020	0.7818	28.41%	93.52%	
1996 Recreational=	0.8000	0.6057	0.7571	27.51%	94.09%	
1997 Recreational=	0.7656	0.6014	0.7855	28.54%	93.43%	

M=0.6

	F Ratio	YPR	SPR	% SPR	% YPR	
F-max =	2.0000	0.5608	0.2779	14.06%	100.00%	Benchmarks
F0.1 =	0.6678	0.4757	0.7099	35.91%	84.83%	
F30% =	0.8460	0.5038	0.5931	30.00%	89.84%	
F20% =	1.3629	0.5422	0.3954	20.00%	96.68%	
1994 Commercial=	0.5000	0.4332	0.8638	43.70%	77.24%	Estimates
1995 Commercial=	0.6700	0.4762	0.7082	35.82%	84.91%	
1996 Commercial=	0.6300	0.4679	0.7401	37.44%	83.42%	
1997 Commercial=	0.2666	0.3213	1.2027	60.84%	57.29%	
1994 Recreational=	0.7000	0.4818	0.6858	34.69%	85.92%	
1995 Recreational=	0.6700	0.4762	0.7082	35.82%	84.91%	
1996 Recreational=	0.7000	0.4818	0.6858	34.69%	85.92%	
1997 Recreational=	0.6656	0.4753	0.7116	36.00%	84.75%	

M=0.7

	F Ratio	YPR	SPR	% SPR	% YPR	
F-max =	2.0000	0.4858	0.2405	16.49%	100.00%	Benchmarks
F0.1 =	0.7970	0.4105	0.5126	35.13%	84.49%	
F30% =	0.9842	0.4332	0.4377	30.00%	89.16%	
F20% =	1.6064	0.4726	0.2918	20.00%	97.28%	
1994 Commercial=	0.4000	0.3140	0.7826	53.63%	64.63%	Estimates
1995 Commercial=	0.5700	0.3671	0.6416	43.97%	75.55%	
1996 Commercial=	0.5300	0.3566	0.6705	46.95%	73.40%	
1997 Commercial=	0.1666	0.1819	1.0896	74.67%	37.44%	
1994 Recreational=	0.6000	0.3742	0.6213	42.58%	77.03%	
1995 Recreational=	0.5700	0.3671	0.6416	43.97%	75.55%	
1996 Recreational=	0.6000	0.3742	0.6213	42.58%	77.03%	
1997 Recreational=	0.5656	0.3660	0.6446	44.18%	76.33%	

M=0.8

	F Ratio	YPR	SPR	% SPR	% YPR	
F-max =	2.0000	0.4218	0.2086	18.93%	100.00%	Benchmarks
F0.1 =	0.9436	0.3596	0.3788	34.37%	85.25%	
F30% =	1.1347	0.3777	0.3306	30.00%	89.56%	
F20% =	1.8747	0.4174	0.2204	20.00%	98.98%	
1994 Commercial=	0.3000	0.2134	0.7089	64.33%	50.59%	Estimates
1995 Commercial=	0.4700	0.2742	0.5812	52.74%	65.02%	
1996 Commercial=	0.4300	0.2622	0.6074	55.12%	62.16%	
1997 Commercial=	0.0666	0.0659	0.9870	89.67%	15.62%	
1994 Recreational=	0.5000	0.2826	0.5629	51.08%	67.00%	
1995 Recreational=	0.4700	0.2742	0.5812	52.74%	65.02%	
1996 Recreational=	0.5000	0.2826	0.5629	51.08%	67.00%	
1997 Recreational=	0.4656	0.2730	0.5840	52.99%	64.72%	

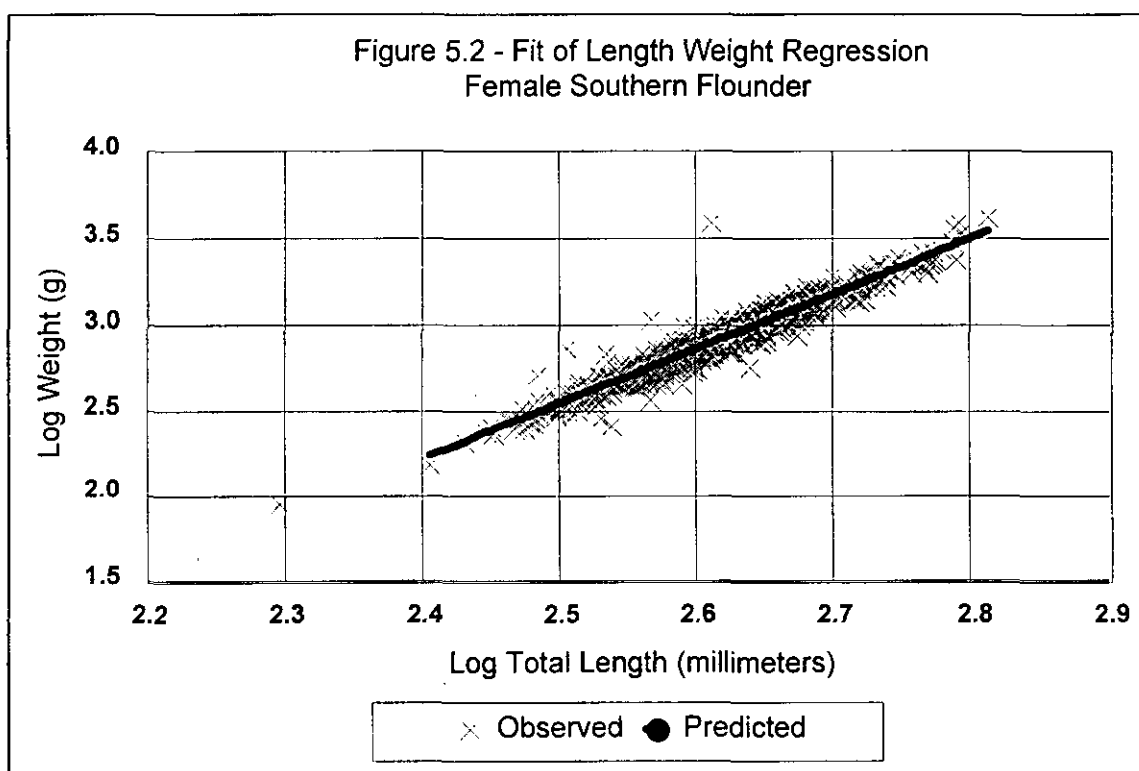
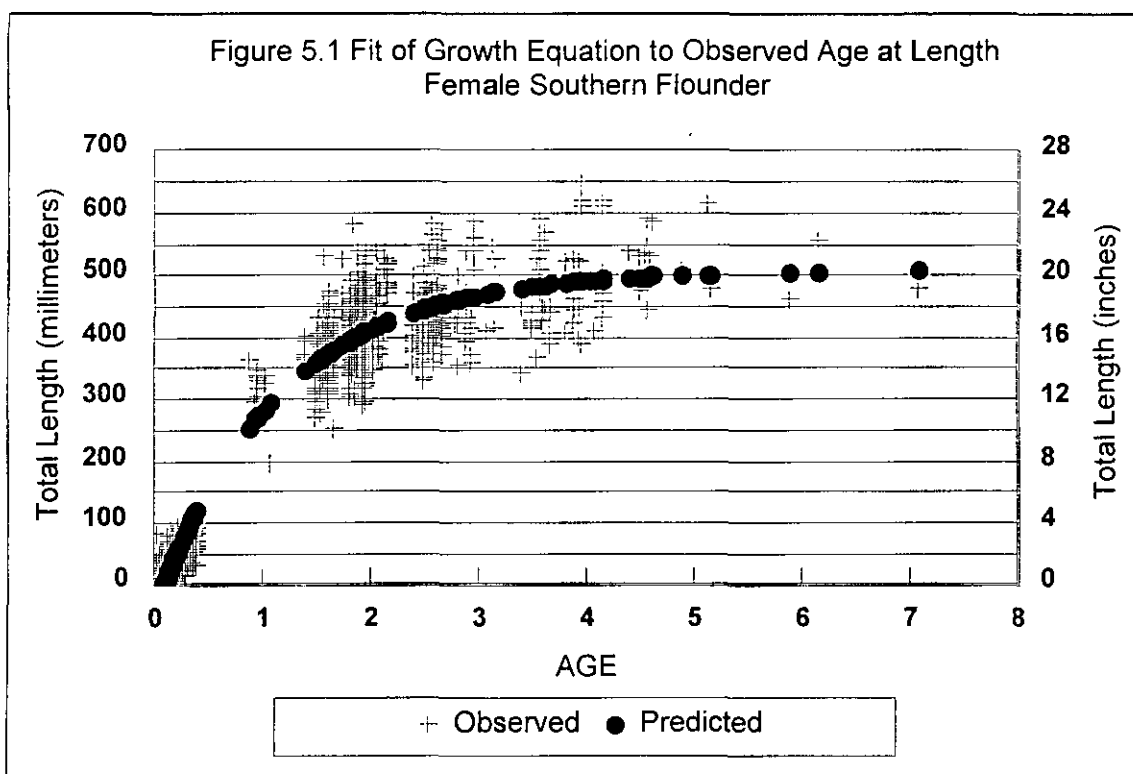


Figure 5.3A - Disappearance Rate for Southern Flounder
Louisiana Commercial Fishery (1994)

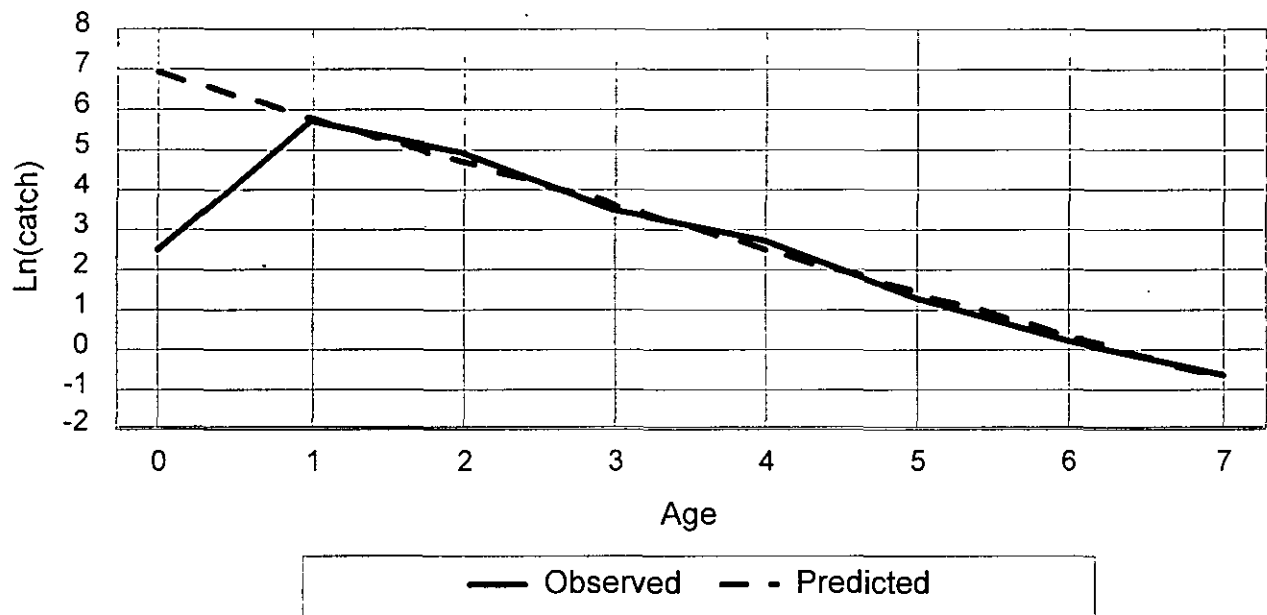


Figure 5.3B - Disappearance Rate for Southern Flounder
Louisiana Commercial Fishery (1995)

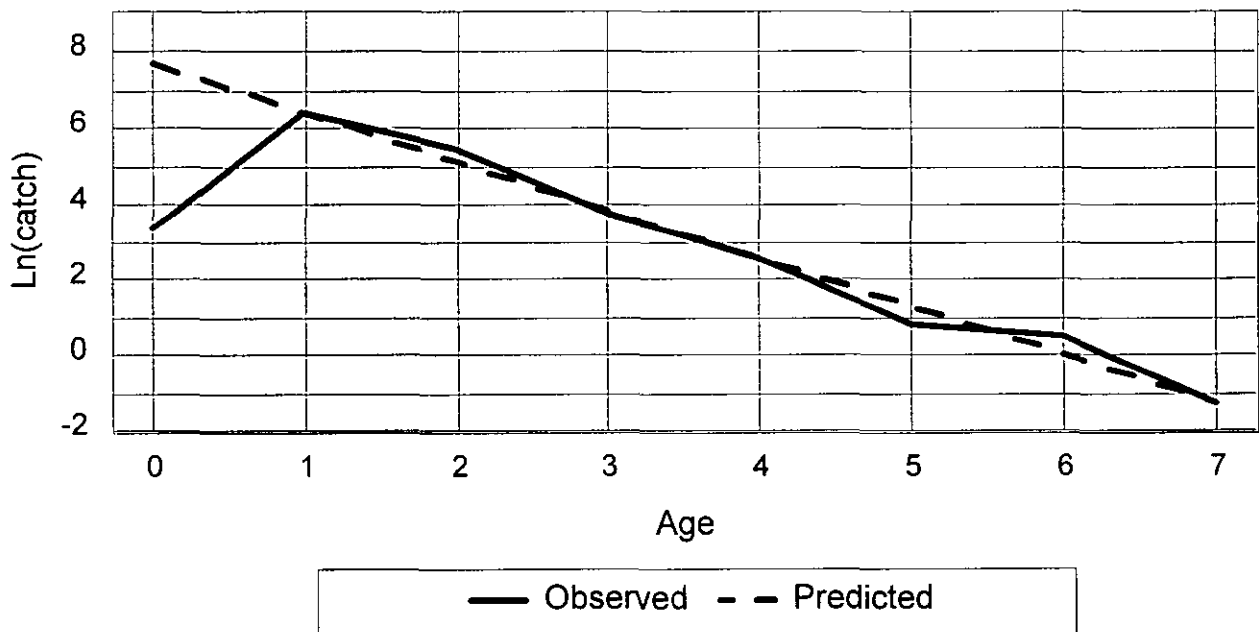


Figure 5.3C - Disappearance Rate for Southern Flounder
Louisiana Commercial Fishery (1996)

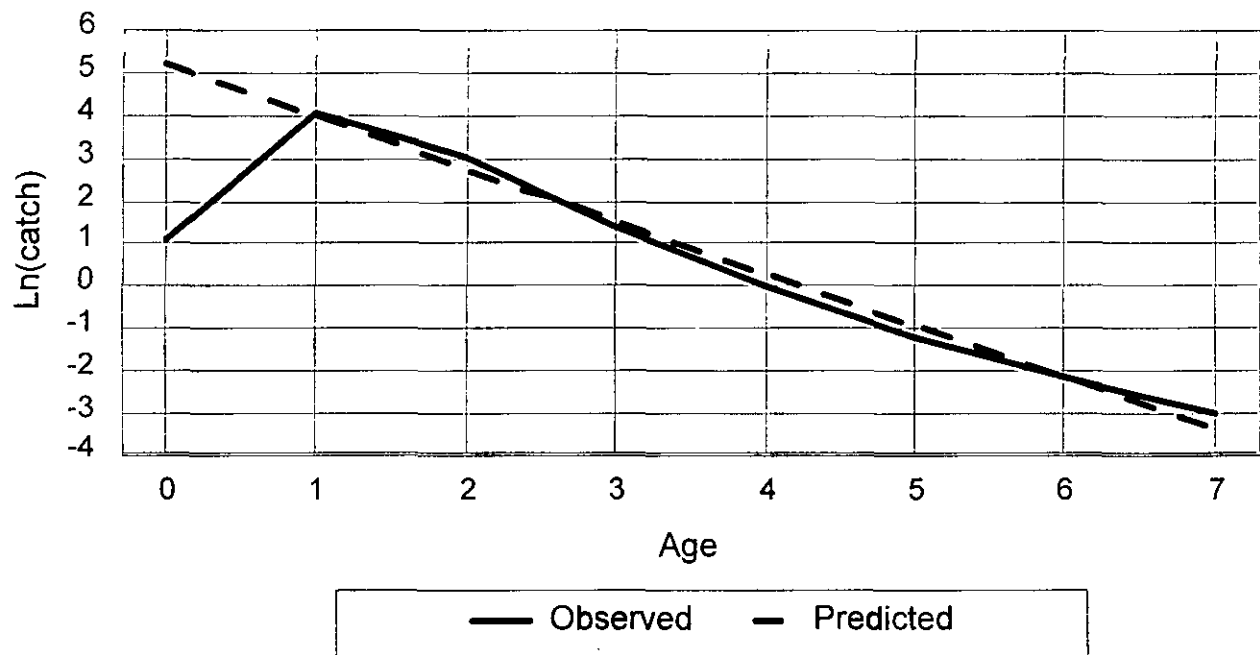


Figure 5.3D - Disappearance Rate for Southern Flounder
Louisiana Commercial Fishery (1997)

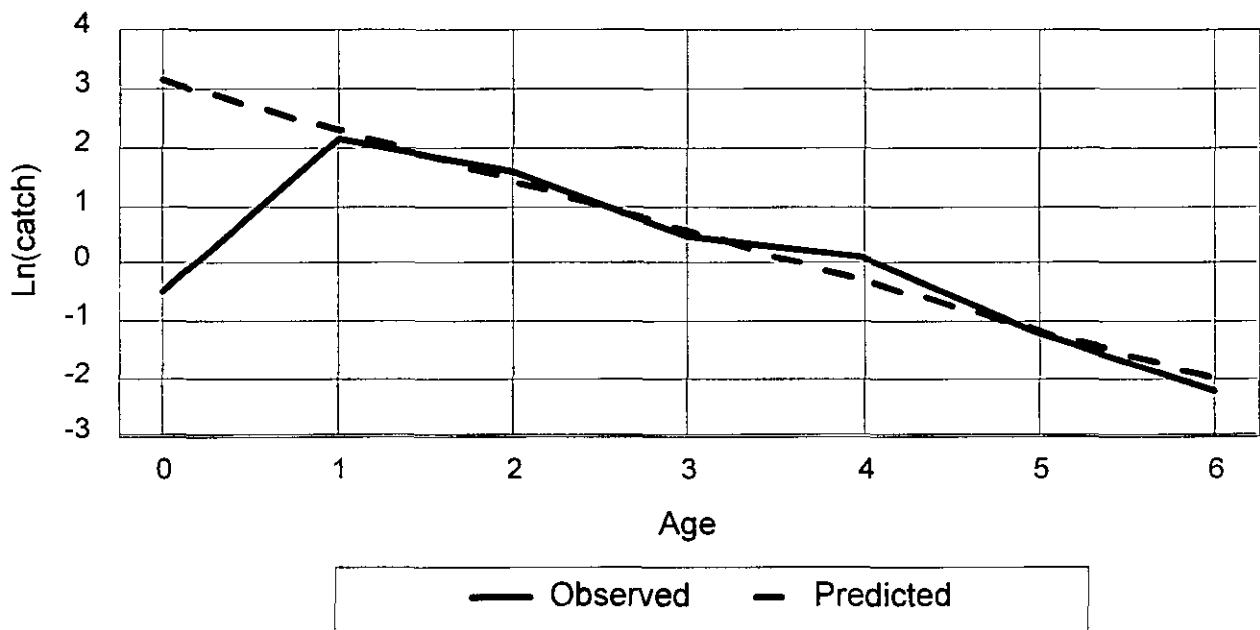


Figure 5.4A - Disappearance Rate for Southern Flounder
Louisiana Recreational Fishery (1994)

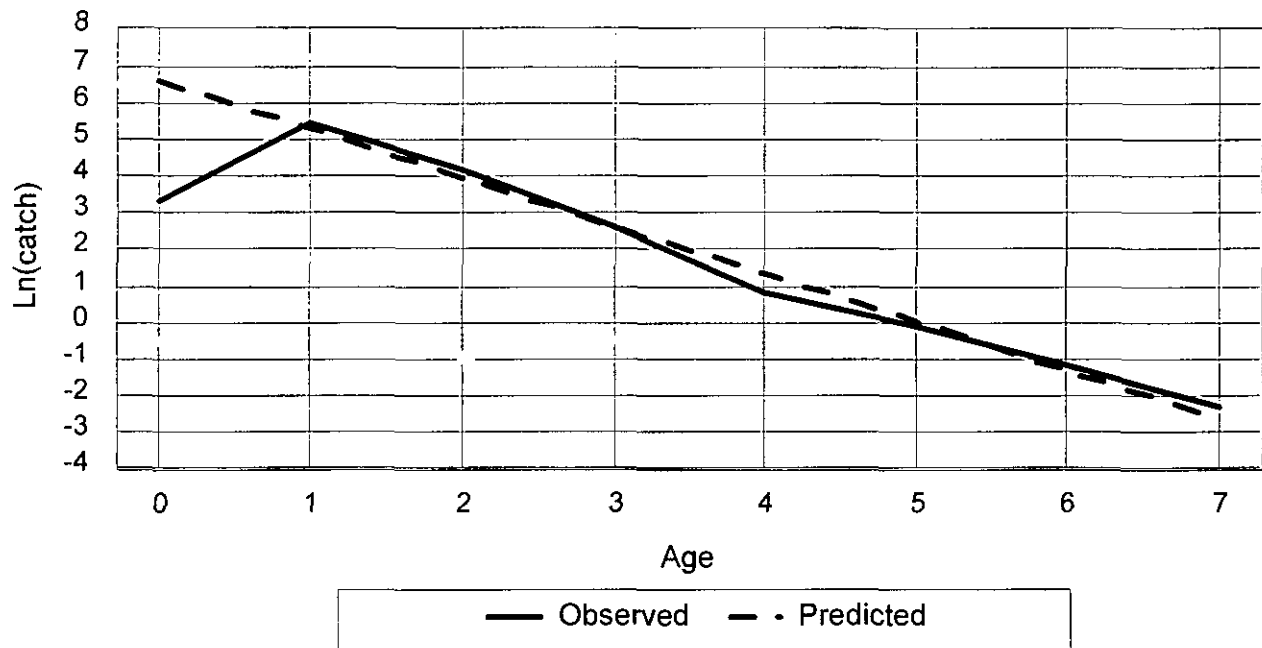


Figure 5.4B - Disappearance Rate for Southern Flounder
Louisiana Recreational Fishery (1995)

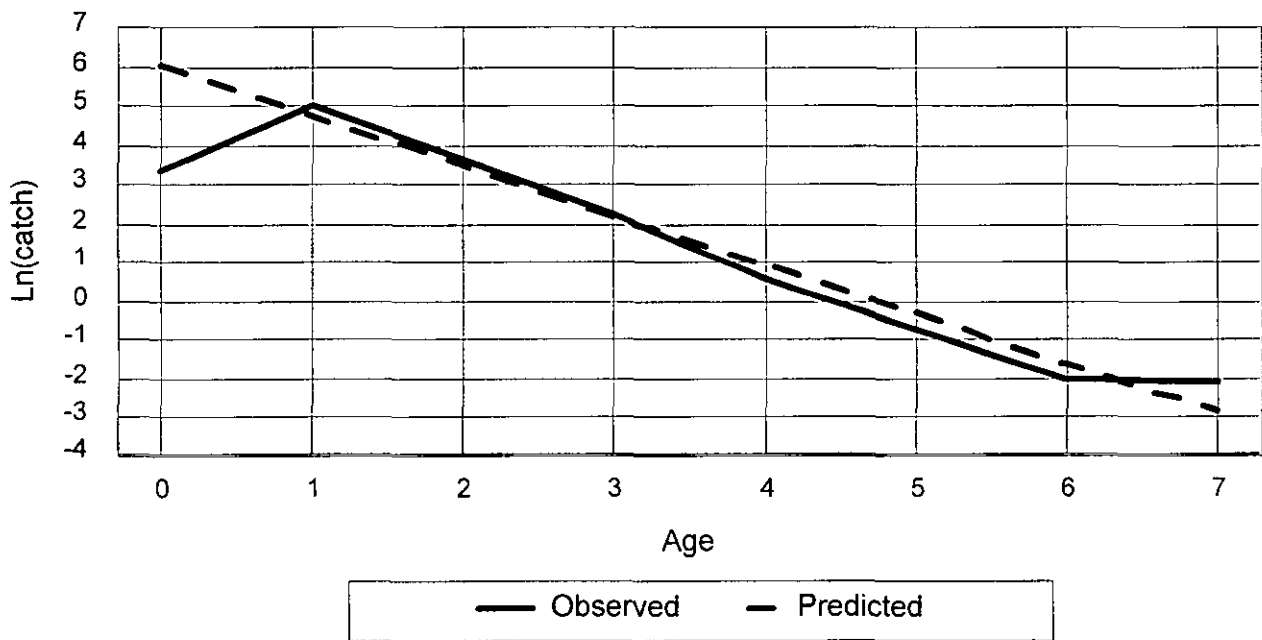


Figure 5.4C - Disappearance Rate for Southern Flounder
Louisiana Recreational Fishery (1996)

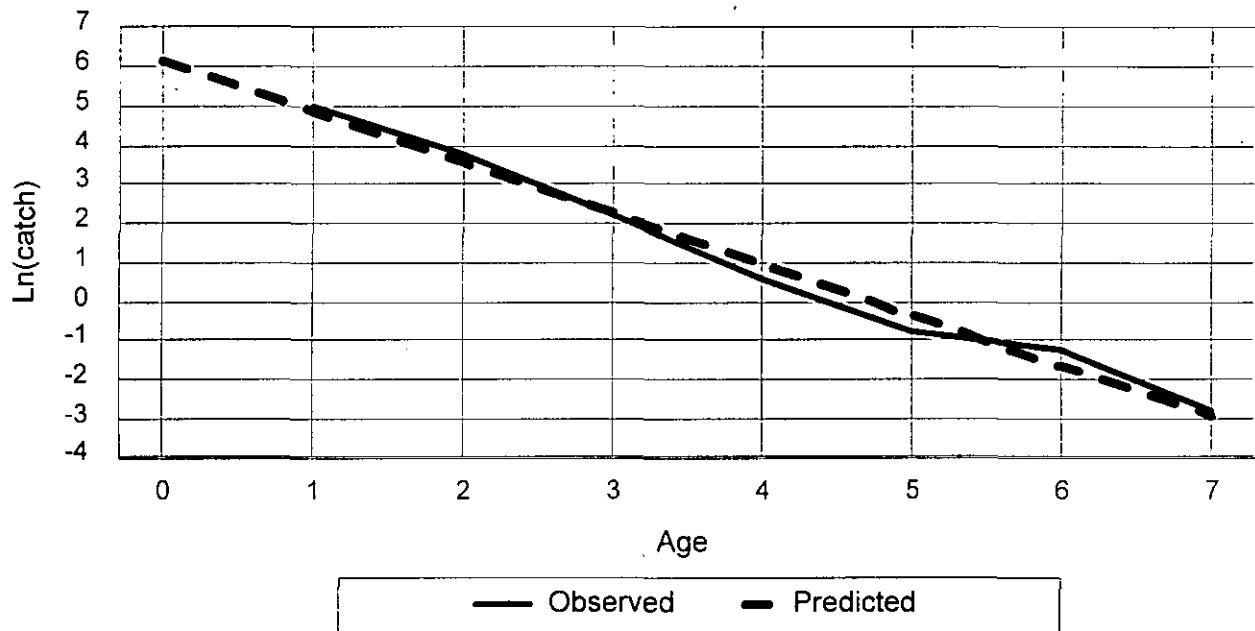


Figure 5.4D - Disappearance Rate for Southern Flounder
Louisiana Recreational Fishery (1997)

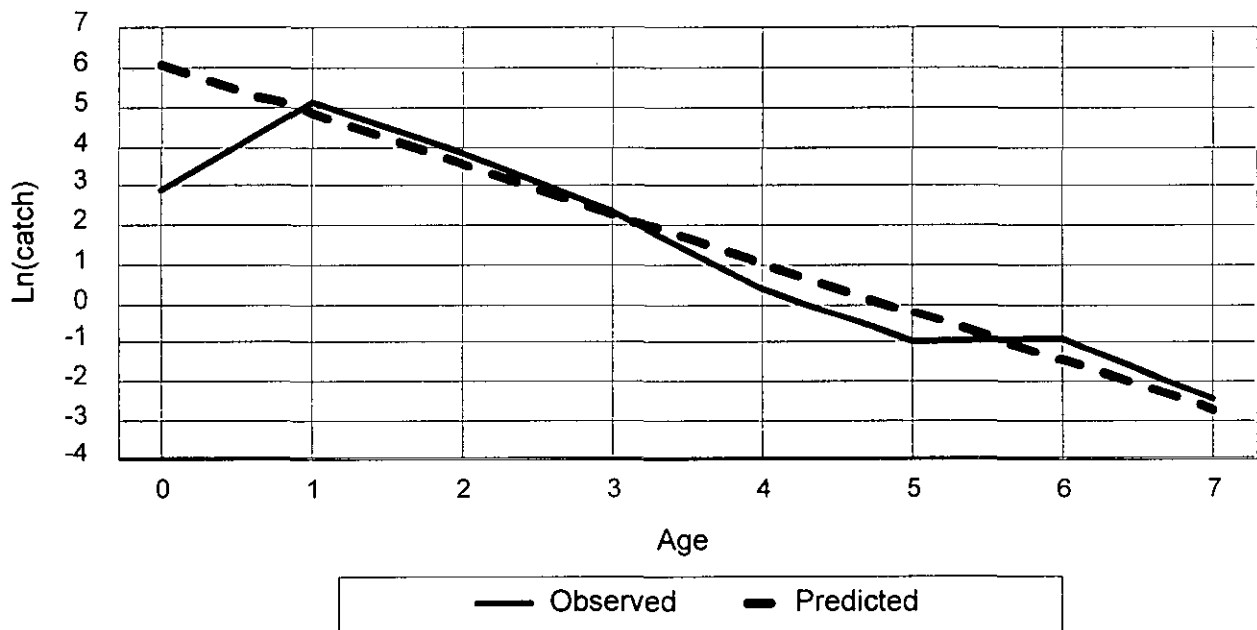


Figure 5.5 - Commercial Harvest of Southern Flounder
in Louisiana

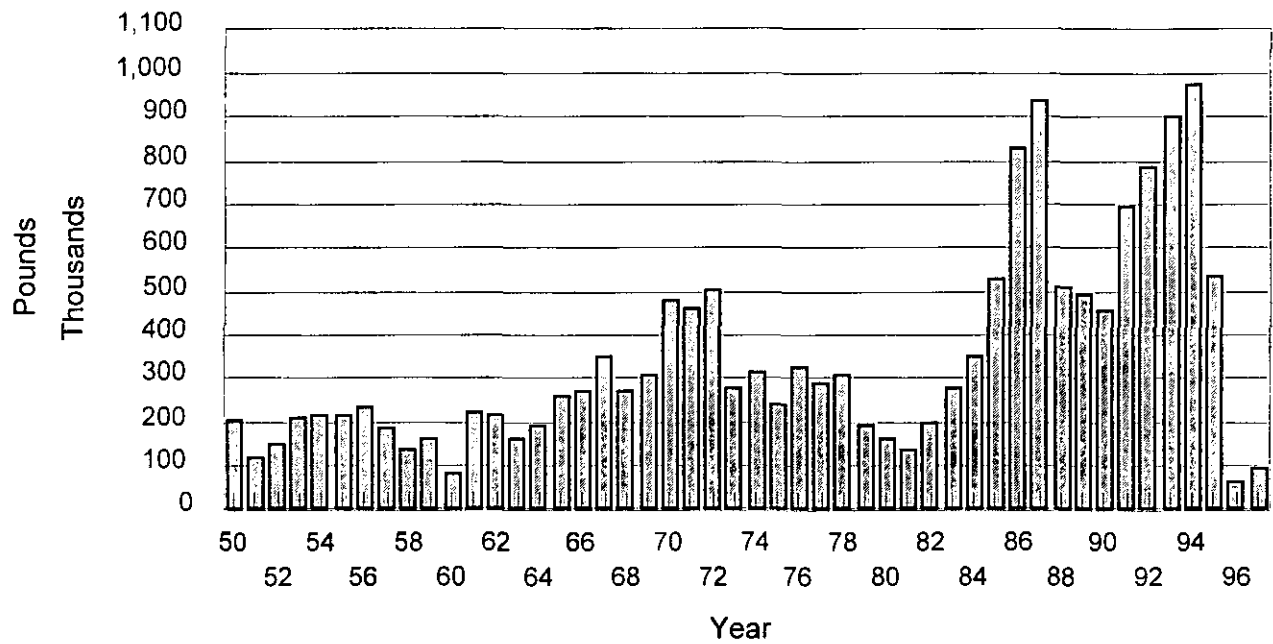


Figure 5.6 - Louisiana Commercial and Recreational Harvest
of Southern Flounder

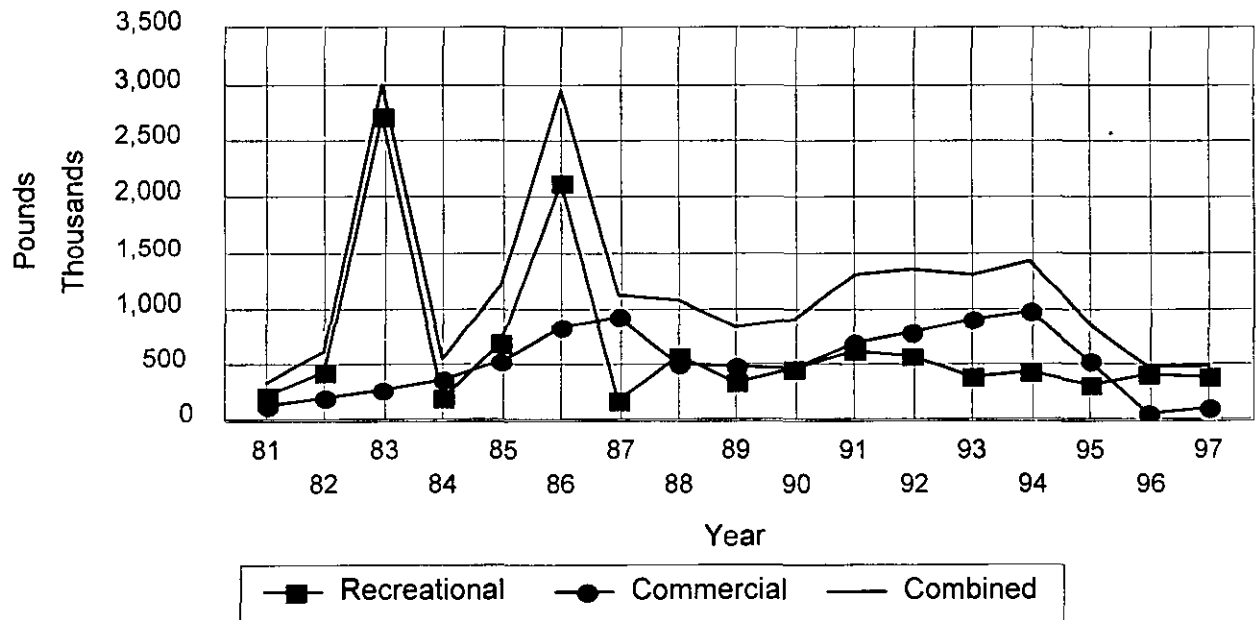


Figure 5.7 - Catch per Effort of Southern Flounder in Louisiana
NMFS Marine Recreational Fishery Statistics Survey

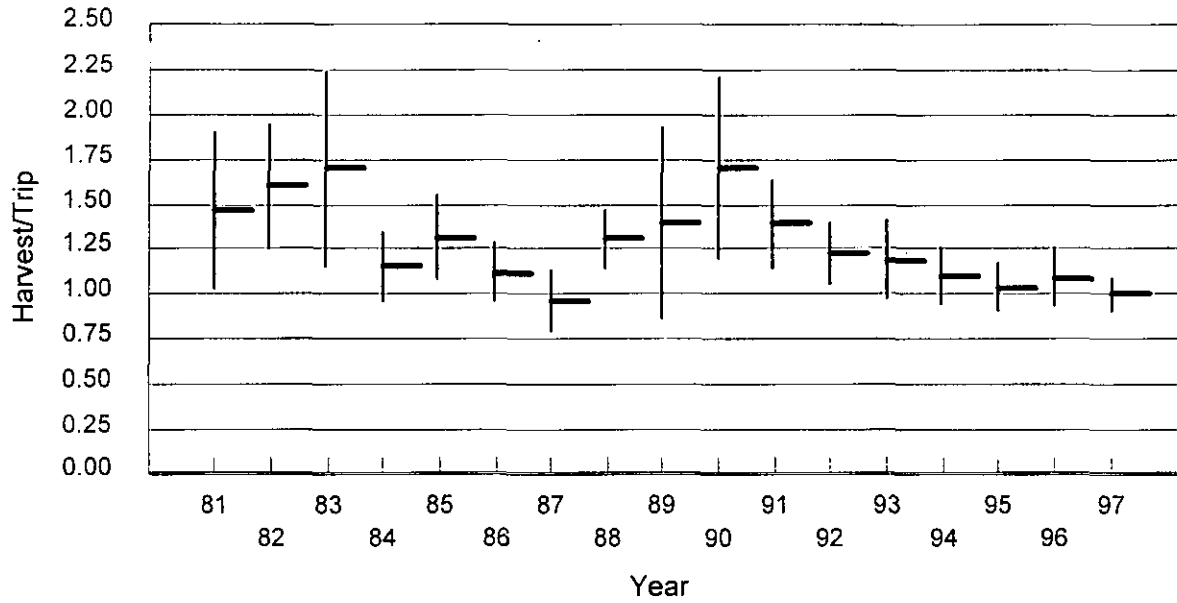


Figure 5.8A - Catch per Effort of Southern Flounder in Trammel Nets
Marine Fisheries Division, Monitoring Program (January - March)

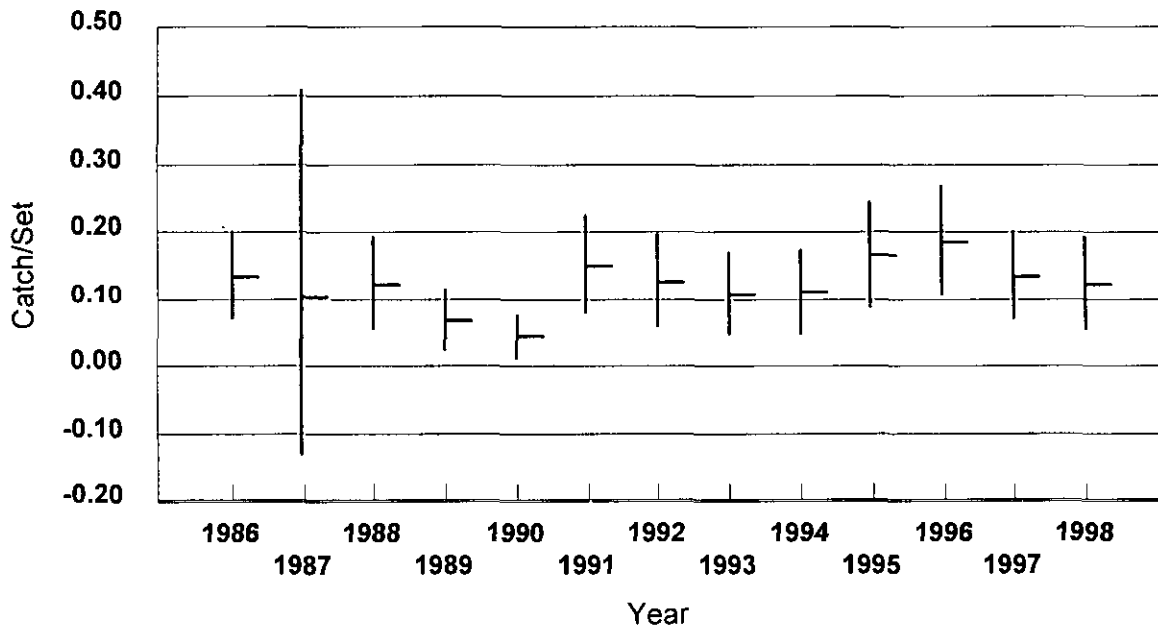


Figure 5.8B - Catch per Effort of Southern Flounder in Trammel Nets
Marine Fisheries Division, Monitoring Program (October - December)

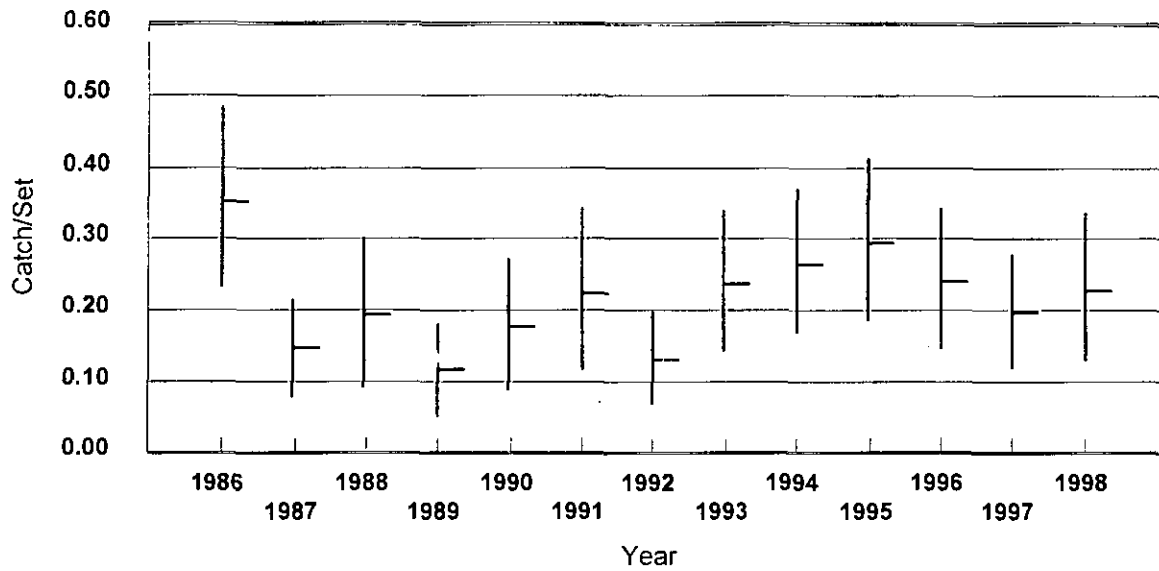


Figure 5.8C - Standardized CPUE of Southern Flounder in Trammel Nets
Marine Fisheries Division, Monitoring Program

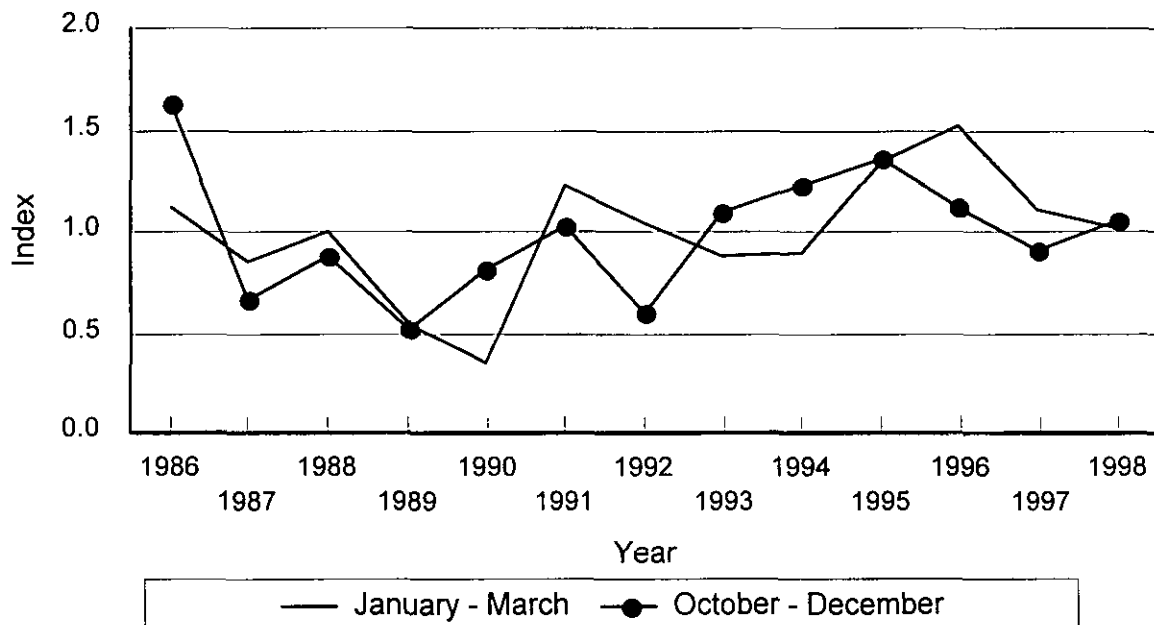
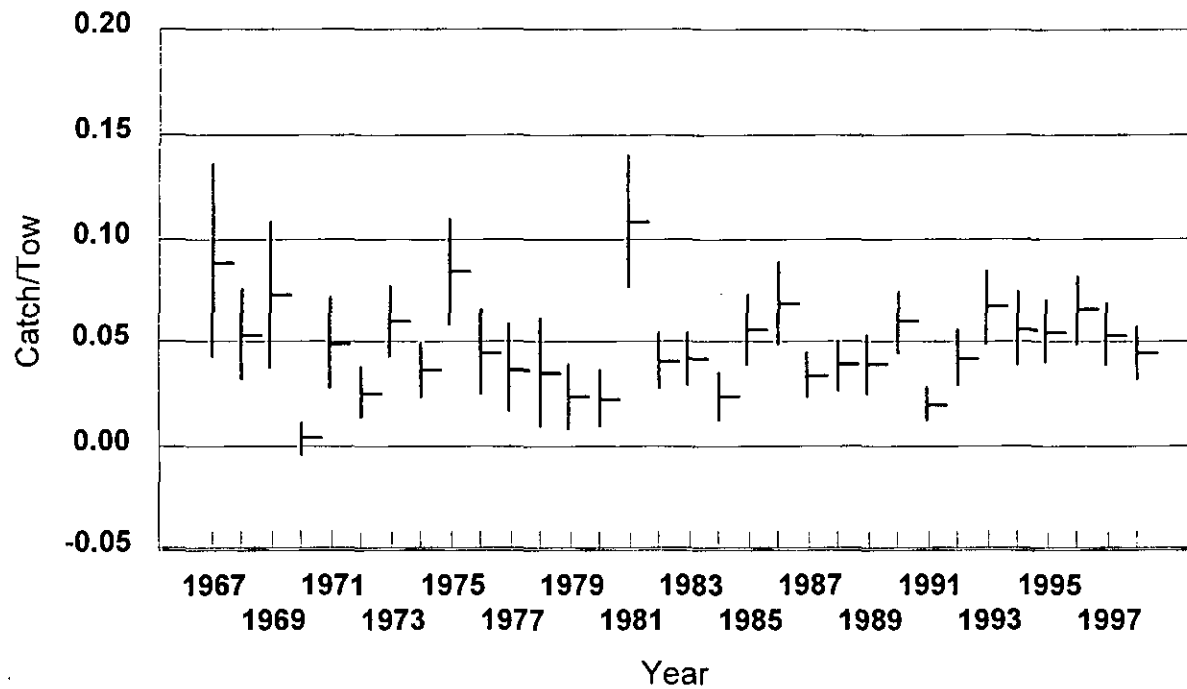


Figure 5.9 - Catch per Effort of Southern Flounder in 16' Trawls
Marine Fisheries Division, Monitoring Program



STRIPED MULLET
SUMMARY OF CHANGES FROM 1998 ASSESSMENT

This summary is intended to provide a quick reference of substantive changes in methods or corrections in this year's assessment from the 1998 assessment conducted for striped mullet.

- The age-length key used last year included some fishery-independent samples from the LSU database, along with the fishery-dependent samples. Those samples were removed from this year's assessment, so that the age-length key is composed only of fishery-dependent samples from LSU and DWF databases. The result was an age-length key that should be a better representation of the ages of fish actually harvested by the fishery.
- Examination of the age-length key and length-frequency of the commercial catch indicated substantial variability in both variables across the state. In order to reduce mis-assignment of ages, only the ages and lengths obtained from fishery-dependent samples east of 90° W Longitude were included in this assessment. That area provides a substantial majority of the total commercial landings from the State.
- Selectivities were re-calculated based on the new age-length key. The age at full recruitment, and the relative selectivities are different from last year's report.

STRIPED MULLET

5.0 STOCK ASSESSMENT

This assessment uses yield per recruit (YPR), spawning potential ratio (SPR) and catch curve analyses to estimate the impact of current fishing pressure on the potential yield and the spawning potential of the Louisiana striped mullet stock. Estimates of YPR and SPR are based on knowledge of the growth of the fish, and on estimates of the natural mortality rate (M) and fishing pressure (F) on the stock. Catch curve analysis is used to estimate the disappearance rates (Z') from the fishery. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock. Therefore, this analysis uses growth rates for female mullet, and considers the effects of fishing on the female portion of the stock. The results of this type of assessment provide a generalized approach for estimating the impact of fishing on the spawning potential and the potential yield of the fish stock. As with any assessment, the results are subject to the limitation of the data from which they are derived. The present analysis should be used only as guidance until more comprehensive analyses, using additional data collected consistently over an extended time span, can be conducted.

The definition of the unit stock must be considered in the development of a stock assessment. While a unit stock is often defined as that portion of the population which is genetically similar, for our purpose in this stock assessment, the most applicable definition seems to be one which considers the unit stock as that portion of the stock which is either dependent on Louisiana waters, or which is available to Louisiana fishermen. We recognize that the geographic distribution implicit in this definition of unit stock is likely to be different from the genetically based definition, given the wide geographic distribution and offshore spawning grounds of the species (Mapes *et al.* 1998). We chose to use this definition because it provides the best picture of the Louisiana fishery, and we do not have information with which to quantitatively define fishing mortality on a regional basis. Information from tagging studies along the west coast of Florida (Mahmoudi, 1991) indicate that once recruited to an estuary, mullet have a strong tendency to return to that estuary after spawning offshore. If this tendency is also expressed in Louisiana, then fishing mortality rates in one area of the state would primarily affect the abundance of the adult population in that area, and not in other areas, unless fishing mortality rates over the entire spawning pool were high enough to affect recruitment on a wide scale.

Estimates of fishing mortality are derived with the knowledge that the existing fishery is not evenly distributed over the entire state, but concentrated in the Southeastern region, and mainly east of the Mississippi River (over 80% of the harvest is typically from that region). The analysis must assume that either the distribution of the fishery does not change, or that all fish in the State are equally available to the fishery for predictive yield calculations to be reasonably accurate. Without knowledge of movement of adult mullet over the entire year, it is difficult to infer how much of the population is actually exposed to the fishery. Only that portion exposed to the fishery is described

here. In order to reduce problems associated with variable growth rates and variable fishing pressures across the state, information for this assessment was limited to that collected from the easternmost part of the state (East of 90°W longitude).

For purposes of this assessment, we did not consider the effects of recreational harvest on the stock. The best information available at this time indicates that recreational harvest is relatively light, typically less than 200,000 pounds of fish per year (National Marine Fisheries Service, Marine Recreational Fishing Statistics Survey, 1981-1995). Based on the sparse length frequency distribution of surveyed fish, most of the recreational harvest is at a size prior to entry into the commercial fishery. The available data suggest that inclusion of recreational harvest data would not have any appreciable effect on the analyses we used (Table 5.1).

This assessment uses a fishing year beginning in February of one year and running through January of the following year for analysis of fishery-dependent information. Thus, the 1997 fishing year, as defined for this report, consists of February 1997 through January 1998. This is to accommodate the existing season for commercial harvest, which runs from the 3rd Monday in October until the 3rd Monday of the following January. Harvest values are presented for each calendar year rather than fishing year for consistency with other reports.

5.1 Growth and Fecundity

Thompson *et al.* (1991) described growth of striped mullet from Louisiana waters. They found significant differences in growth rates between sexes of mullet, and in growth rates from different parts of the state. For this assessment, a von Bertalanffy growth equation was developed from aged samples of female striped mullet from East of the Mississippi River provided by Thompson (pers. comm.). Growth rates from this area were used since this area of the state provides the majority of the harvest. We reanalyzed these data, combining them with juveniles assigned to age 0 by length frequency analysis from LDWF fishery-independent seine samples (Burdon *et al.* 1998, Figure 2.1). These data were used to estimate a three-parameter von Bertalanffy growth equation:

$$L_t = L_{\infty} * (1 - e^{(-k(t-t_0)})}$$

where L_t is the length at age (t) in years, L_{∞} is the maximum length, k is a parameter describing the rate of growth, and t_0 is the intercept of the function on the time axis. The function was estimated using nonlinear approximation procedure (SAS, 1987). The parameters derived from this method were: $L_{\infty}=453.9$, $k=0.332$, $t_0=-0.05$. These parameters were used in some methods of estimating natural mortality, and for yield estimation.

Samples were assigned ages through use of an age-length key developed from otolith aging of fish by Thompson (unpublished data) and LDWF's ongoing aging study. The age-length key categorized fish in increments of one-inch (25.4 mm) total length. Fish with only fork length measurements available were converted to total length using the equation provided by Thompson *et al.* (1991) ($TL=1.13*FL-3.40$, $r^2=.995$). Only data from female mullet was included (males, immature fish, and fish where sex was not recorded were all deleted). Data from purse seine samples from Mississippi waters, and from mullet in the Sabine (LA) Refuge impoundment were deleted from the LSU dataset, as the length/age relationships for these fish are expected to differ from the fish harvested in the ongoing Louisiana fishery. Most fishery-independent collections were deleted from the dataset for the same reason. However, the age distribution for 11-inch fish was derived from fishery-independent samples since no fishery-dependent ages were available for that size class. This size class represented less than one percent of the total harvest, so any error due to misassignment of ages should have minimal impact on the assessment.

As noted earlier, the fishery is concentrated in the area East of the Mississippi River, and in the Mississippi River delta. Examination of fishery-dependent age-length keys and length-frequency samples from different areas of the state demonstrated substantial differences in length-frequency and in age-at-length between areas. Therefore only samples taken East of 90°W longitude were included in this assessment. Exclusion of the samples from the remainder of the state should provide a more accurate assessment of the potential yield of this area, where the majority of the fishery operates. Spawning potential ratio (SPR) estimates specifically calculated by this method would not be valid for the state as a whole, but should be more accurate representation of the status of the fished portion of the population in this region.

One thousand eighty-one aged female fish were used in the development of the age-length key (Table 5.2), including 943 fishery-dependent samples from East of 90°W longitude. The remainder of the samples were the samples of fishery-independent 11-inch fish described earlier. The age-length key used in this report is significantly changed from the one used last year, and is the primary reason for the change in the numerical results of the assessment.

Fecundity is estimated from the length/fecundity relationship of Thompson *et al.* (1991) where:

$$\text{Fecundity}=5.6 \times 10^{-3}(\text{FL})^{3.18}$$

Fish were assumed to be sexually mature at age 2.

5.2 Natural Mortality

There was no change in the techniques used or the input parameters for estimation of natural mortality for striped mullet since the development of the 1997 and 1998 reports. The various estimates and the citation describing the methodology used to derive that estimate are listed below.

Citation	Input parameters	Natural Mortality estimate
Pauly (1980)	$k = 0.332$ $L_{\infty} = 453.9$ \bar{x} water temperature ($^{\circ}\text{C}$) = 22.7	$M_{\text{schooling fish}} (\text{est.} * 0.8) = 0.56$ $M_{\text{clupeids}} (\text{est.} * 0.6) = 0.42$
Hoenig (1983)	$\text{Age}_{(\text{max})} = 10$	$M = 0.42$
Alagaraja (1984)	99% of fish die by Age 10 99.9 % of fish die by Age 10	$M_{1\%} = 0.46$ $M_{0.1\%} = 0.69$
Beverton and Holt (1959)	1.5 to 2.5 von Bertalanffy growth parameter (k), $k = 0.332$	$M = 0.50 - 0.83$

Two estimates of natural mortality (M) are available for striped mullet in the existing literature. Pauly (1980) cites Ih-Hsiu (1970) as reporting an M of 0.31 for male striped mullet from Taiwan. Mahmoudi (1991) estimated M as 0.30 using tagging data from southwest Florida.

Some investigators (Restrepo *et al.* 1991, Helser *et al.* 1992) have attempted to use a range of estimates of M and incorporate variation within this range as a variable in their analyses of other fish species. However, the selection of the range to be used, and the distribution of M estimates within that range remains arbitrary. We have chosen, rather, to select several point estimates of M , and to present the results of changes in the estimate. We have presented estimates based on M values of 0.3, 0.4, 0.5, and 0.6. This provides a feeling for the differences resulting from various estimates of M , without implying any additional precision.

In this report, an M of 0.3 is the most conservative estimate of natural mortality. This estimate may be low, based on the lack of mullet older than 10 years in the Western part of Louisiana, though there was no established mullet fishery in that area when the samples were taken. Using a low value of M results in higher estimates of F in the analysis. If the actual value is above estimates used here, estimates of fishing mortality from catch curve analysis will be lower than estimated here. Additionally estimates of spawning potential ratio at any level of fishing mortality would also be increased, and potential yield will be higher than estimated with that value. A low estimate of M would also increase the harvest age structure required to maximize yield, which could influence proposed size or gear regulations.

5.3 Disappearance Rates and Fishing Mortality

It must be recognized that any estimate of disappearance (Z') from the fishery includes both the total mortality while the fish is exposed to the fishery, and the availability of the fish to the gear. Availability as used here includes both changes in distribution or behavior of the fish that might change effectiveness of the fishery (e.g. migration, food preference, etc.), and size or other selectivity of the gear or fishery. The predominant gear in the Louisiana mullet fishery at the present time is a 3½ -4 inch stretch gill net, though some larger mesh sizes are occasionally used (see Mapes *et al.*, 1998). Gill nets are size selective for mullet, therefore estimates of disappearance likely reflect fishing mortality confounded by some degree of gear selectivity. For the present analysis, no estimation of gear selectivity or availability to capture was available for fish past full recruitment. Selectivity of younger fish is estimated from the method presented in Sparre and Venema (1992), using a linearized catch curve to determine the selectivity of fish not fully recruited to the fishery. The ratio of the observed catches to the expected catches at each age is the relative probability of capture or selectivity of the fishery. Selectivities for ages up to full age-at-recruitment were used to describe the relative fishing mortality to that point; for ages at or above full recruitment, selectivities are usually assumed to be 1, or 100% selected. In this assessment, due to the substantial variation around the regression line (see Figure 5.3) we also specified the annual selectivities by year throughout the ages found in the fishery. This procedure did not change the estimates significantly - variation in SPR was in the third significant digit, and 1% of the YPR estimate.

Length frequency data from the mullet fishery, derived from Trip Intercept Program (TIP) sampling (LDWF unpubl. data), are available for the fishing years 1994-1997. These samples were aged, using an age-length key (Table 5.2). The resulting age frequency distribution is presented for each of those years in Figure 5.2. Yield calculations were based on relative selectivities estimated from the mean of the estimates for the 1996 and 1997 fishing years (2/96 - 1/97, 477 female fish measured; 2/97-1/98, 1036 female fish measured). The age frequency estimates for each fishing year (1996 and 1997) were calculated separately, and estimates derived of relative selectivity and disappearance rate from the fishery (Figure 5.3) The mean of the two estimates of selectivity at each age and disappearance by year were used to estimate the yield per recruit and spawning potential ratio.

The relative selectivities for each age are as follows:

Ages	Relative selectivity
0	0
1	0.0000782
2	0.0153229
3	0.1427348
4	0.5689896
5	0.9639572
6	1.0231652
7	0.6349109
8	3.1077395
9	0.6020140
10 and over	1.0

While age-5 was specified as age of full recruitment, ages older than that exhibited a consistent pattern in relative estimated abundance in the harvest. Especially notable was the unexpectedly high abundance of age-8 fish. Due to the presence of this pattern, relative selectivities were used for each age where they were available.

Estimates of Z' were derived by regression of the descending arm of the catch curve (ages 5-9, Fig. 3). The resulting estimate of Z' was approximately 1.465 on an annual basis.

These estimates of Z' and relative selectivity could be confounded by variable sizes of cohorts within the fishery. Variation in cohort size could skew the estimate of Z' in either a positive or negative direction, depending on the distribution of the various cohorts within the fishery. Greater recruitment in the older year classes would provide a lower estimate of Z' , while if in younger ages, would provide an overestimate of the true value of Z . This uncertainty can only be addressed by use of several years of information on the fishery, and using estimates of Z based on specific cohorts rather than using annual estimates, that run across several cohorts.

Based on the estimated Z' values ($Z'=1.465$), if Z' is composed only of F and M (no availability component), and the estimate of 0.3 used for M , the estimate of fishing mortality (F) is approximately 1.165. If the lowest estimate for M ($M=0.3$) is used, the resulting value of F is maximized. For each incremental increase in the value of M , the value of F is decreased the same amount. Therefore, if we use $F=1.165$, fishing mortality rates are maximized. This estimate of F minimizes the potential for underestimation of F , minimizes the potential benefits from increased fishing pressure, and maximizes the estimated impact of existing fishing pressure on the stock.

5.4 Yield per Recruit

Yield per recruit (YPR) analysis provides basic information about the dynamics of a fish stock by estimating the impact of mortality rates on yield and spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential. The present yield per recruit (YPR) analysis is based on several assumptions. A fish is assumed to consistently recruit to any given fishery at a given age; that is, selectivity by age does not change over time. Partial recruitment of fish is estimated from the relative abundance of age 1 through age 4 fish in the TIP samples compared to age 5 fish, which are fully recruited (Figure 5.3). Once the fish are fully recruited to the fishery, fishing pressure is assumed to be at a constant rate. The present YPR analysis does not take into account any variation in growth rate or other factors which may affect the results. Use of YPR analysis requires:

- 1) information on natural and fishing mortality rates,
- 2) knowledge of the growth parameters of the fish.

Methods used for estimation of natural mortality (M) and fishing mortality (F) rates in this analysis are presented in Sections 5.2 and 5.3 above. The existing mullet fishery is mainly a roe fishery, targeting female fish (Thompson, 1989). Therefore, we have used the growth parameters for female mullet to calculate yield per recruit.

5.5 Conservation Standard

Conservation standards are based on one of a number of biological measures of the dynamics of fish stocks, that are intended to protect the viability of that stock for future generations. These standards have historically been based on different measures of the dynamics of fish stocks, depending on the data available, the needs of fishery and of the resource. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based, and a conservation target which considers biological measures modified by relevant social, economic, and ecological factors.

Conservation "thresholds" are intended to provide a biological baseline for harvest of a fish stock based on stock recruit relationships, or other biological parameters specific to the stock, if possible. This baseline standard, below which the stock should not be allowed to go, has been described as a "threshold" by some researchers, and has also been referred to as an "overfishing level" (GMFMC 1995). Beyond this "threshold", management "targets" may be set, which provide for other management goals in the fishery. Such goals may be in terms of yield in weight, yield in numbers of fish, catch rate per effort, harvest rate per effort, employment, profit, or some other goal. These targets must be set at a fishing rate below the "threshold" in order to ensure that the biological integrity of the stock is not unduly compromised by fishing.

Recently, use of a stock measure, spawning stock biomass per recruit (SSBR) or spawning potential ratio (SPR) has become widely used. This measure compares the estimated female spawning biomass of the stock that survive fishing with the estimated biomass of the stock under unfished conditions. The analysis does not take into account any density-dependent relationships due to the changes in the size of the fished stock. Using the Spawning Potential Ratio (SPR) concept as developed by Gabriel et al. (1984) and refined by Goodyear (1991), a "threshold" value can be defined that provides a minimum spawning stock biomass (or egg production) per recruit, below which existing data cannot evaluate impacts to future recruitment, and below which the fishery should not be allowed to operate.

Ideally, "threshold" levels should be evaluated from information on the stock in question. However, the information base necessary to adequately describe this level is often not available. In such cases, it has been recommended by Goodyear (1989) that a spawning stock biomass per recruit (SSBR) or SPR of 20% be used as a "threshold" in absence of sufficient evidence to provide a standard specific to the stock in question. This standard is also based on work on North Atlantic groundfisheries (Gabriel et al. 1984, Gabriel, 1985). A SSBR of 35% has been recommended for Spanish mackerel, and 20% for king mackerel (GMFMC 1990, 1995). A SSBR of 8-13% has been demonstrated to be sufficient for Gulf menhaden (Vaughan 1987). In prior analyses of the Louisiana spotted seatrout fisheries (LDWF 1991), we recommended an SPR of 15% after analysis of several years of available data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and recommended that 30% SPR be maintained when there is no other basis for estimating the replacement level. That level is sufficient for 80% of the stocks considered by those authors. They also noted that 30% may be overly conservative for an "average" stock. The average replacement %SPR for the stocks they considered was 18.7% while the most resilient quarter of the stocks considered required a maximum FREP of 8.6% SPR. Three-quarters of the stocks required a maximum FREP of 27.1% SPR. In the prior assessment of striped mullet (Shepard et al., 1992), a SPR of 20% was recommended as the conservation standard for the Louisiana fishery. This standard was considered, rather than 30% SPR, due to several factors: the fishery is mainly prosecuted on the stocks of mullet east of the Mississippi River, and the estimate of SPR is based on only the fished stocks. The relatively unfished stocks to the west of the Mississippi River are only minimally considered in the assessment, with the result that the SPR ratios are underestimated.

Sufficient information is not available to directly estimate a conservation threshold for striped mullet in Louisiana. However, the conservation target of 30% SPR established by Act 1316 of the 1995 Regular Session of the Louisiana Legislature for black drum sheepshead, southern flounder and striped mullet appear to be adequate to maintain the striped mullet stock and prevent recruitment overfishing.

The use of any measure of health of a fish stock as a perfect index is arguable. Intuitively it seems more logical that growth overfishing would occur at a much lower fishing rate than would

threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced levels of recruitment at levels of fishing that would not reduce yield per recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock and recruitment for that species, in the same fishery. This requires a base of information on that fishery that requires monitoring of both the stock and the fishery over a variety of conditions. Without this information, inappropriate conservation standards may either underestimate or overestimate the potential of the fishery. If the potential is underestimated, the society loses the economic and social benefits of the harvest. If the potential is overestimated, the society also loses the benefits of a sustainable fishery, which must at least go through some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993). Some researchers have speculated that over-harvest of some stocks may lead to their replacement in the ecosystem by other, often less preferred stocks. The frequency of such an occurrence is unknown, and the cause of shifts in species dominance in an ecosystem may be difficult to ascertain, even after the fact. Such a shift does seem to have occurred over time in the Grand Banks area, where prolonged, intense harvest of cod and haddock have been implicated in gradual increases in skate and spiny dogfish populations (CUD - NEFSC 1993).

5.6 Status of the Stock

The trends in harvest for striped mullet in the Louisiana fishery have been reviewed by Mapes *et al.* (1998). The harvest increased significantly in the late 1980's and early 1990's, as the fishery developed (Figure 5.1). Harvest declined in 1996, and remained stable in 1997. Regulations implemented in August, 1995 eliminated the harvest of mullet outside of the period between the third Monday in October through the middle of the following January. They also outlawed fishing for mullet at night, on weekends, in freshwater areas, and using gear other than strike gill nets.

Annual recruitment of mullet has been evaluated from fishery-independent seine and experimental gill net samples taken statewide since 1986. Catch/effort information are compiled for January through May of each year, and the abundance is measured as $\ln(\text{catch/effort})+1$, for each station/month/year. Seine catches of fish larger than young-of-the-year are removed from the calculation of abundance indices for that gear. Gill net data from 2", 2.5", and 3" (5.08, 6.35, and 7.62 cm.) stretch mesh panels are used as these provide information on abundance prior to harvest by legal saltwater commercial gears (gill and trammel nets, and saltwater seines) during the time period considered. These data are summarized in Figures 5.5 and 5.6. The length frequencies of the striped mullet captured in the three types of gill net sampling gear are pictured in Figure 5.7.

Significant annual variation was found in the seine data (Table 5.3) and the gill net data. Seine data indicate relatively strong recruitment indices in 1986, 1987, 1988, 1996, 1997, and 1998 and relatively weak indices in 1989, 1991, and 1995 (Figure 5.5). However, only 1986 and 1996-

1998 are significantly higher than most other years, according to Duncan's Multiple Range Test using a General Linear Model procedure (Table 5.4) (SAS, 1987). Gill net samples (Figure 5.6) also indicate variable recruitment, with high indices in 1986 for the 1" bar mesh gill net, in 1988 and 1996 for the 1.25" bar, and in 1987 and 1996 for the 1.5" bar net samples. There seems to be some correspondence between the indices provided by these three different gears, as might be expected due to some overlap in the size frequencies sampled by the gears (Figure 5.7). We examined the data for differences between the months making up the index (5 months) and the geographic zones of the state (7 zones). Considering variation due to variation between months and geographic zones within the state (Type III Sum of Squares), the YEAR variable remained significant at the $p=0.01$ level in both the seine (Table 5.3) and gill net (Table 5.5) datasets. No temporal trend is evident in either of these data sets (Figures 5.5 and 5.6).

We developed a series of estimates representing the effect on yield per recruit (YPR) and spawning potential ratio (SPR) of various fishing and natural mortality rates under existing relative fishing rates by age (Figure 5.4). Estimates were based on the length/age and length/fecundity functions described in Section 5.1 above.

Based on the information provided, our best estimate of the current status of the stock is depicted in Figure 5.4 and Table 5.7, assuming the relative recruitment to the fishery is constant, as discussed in Section 5.4, above. On this basis, if $M=0.3$, then $F=1.165$, and SPR is approximately 31%. Even with very strong increases in fishing pressure, SPR would not be driven below 20%. At $M=0.3$, fishing mortality is at a level above F_{MAX} , but YPR from the fishery is near the maximum. If M is greater than 0.3, then SPR is above the level estimated for that M , and if $M=0.4$, the fishery is operating slightly above F_{MAX} , so no additional YPR could be expected from increased fishing rates. If M is actually higher than that level, additional yield could be obtained from the fishery through higher fishing rates than present.

In all of these analyses, assumptions listed in prior sections of this report have a strong influence in the results. If M is actually near or above the upper end of the range considered here then increases in yield per recruit would be possible, and SPR would be above the minimum estimated values. Estimates of potential yield presented here do not account at all for potential extension of the fishery into areas of the state that do not now have a significant fishery. Any substantive change in geographic distribution of the fishery could substantially change the overall harvest levels.

Table 5.7 provides a summary of some of the more common benchmarks for stock assessments, as they apply to Louisiana striped mullet. Data for the $M=0.3$ to $M=0.6$ level are provided.

Based on this generalized assessment, for all natural mortality rates examined, if fishing mortality rates continue at the 1990-1995 levels, then striped mullet are not being harvested at a rate that would drive the stock below the target SPR of 30% established by the Louisiana Legislature.

5.7 Research and Data Needs

As with any analysis, the accuracy of the assessment is dependent on the accuracy of the information on which it is based. The present analyses, along with the biological data presented by Mapes *et al.* (1998) identify several areas for research to address.

Estimates of natural mortality used in the present assessment are derived from general literature sources, and show wide variation. This variation reduces the potential of the present assessment to provide a precise prediction of the yield potential of the stock, and also reduces the confidence level of the present estimate of SPR. A more precise estimate of natural mortality, based on Louisiana data, would assist in both of these problems.

Definition of sub-populations based on migratory patterns would help define exploitation rates within different areas of the state. This may help managers develop area-specific management to optimize yield from a given stock, while protecting the stock from overharvest.

Recruitment mechanisms are poorly defined for the species. Mullet are recorded to spawn beyond the shelf break, in the central Gulf of Mexico. No genetically distinct stocks have been identified within the Gulf. However, lack of genetic distinctness does not necessarily mean that stocks are homogeneously mixed by spawning and recruitment mechanisms, only that populations are not so removed from each other that gene structure is identifiably different. Better understanding of recruitment mechanisms, merged with measurement of oceanographic or other driving forces could help in understanding the sub-genetic distinctiveness of mullet populations from different regions of the state of the Gulf of Mexico.

Factors that influence the year-class strength of mullet are essentially unknown. Investigation of these factors could help better define causes of inter-annual variation in abundance, and perhaps also the underlying stock-recruit relationships in the species.

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for any of a suite of different species. Understanding of this relationship for mullet should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of the data necessary to assess the status of a fish stock. However, such data is necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

Literature Cited

- Alagaraja, D. 1984. Simple methods for estimation of parameters for assessing exploited fish stocks. *Indian J. Fish.*, 31:177-208
- Beverton, R.J.H. and S.J. Holt, 1959. A review of the lifespans and mortality rates of fish in nature, and their relation to growth and other physiological characteristics. *In: G.E.W. Wolstenholme and M. O'Conner, (eds.) The Lifespan of Animals*. CIBA Foundation, Colloquia on Ageing, Vol 5: 142-180.
- Conservation and Utilization Division, Northeast Fisheries Science Center. 1993. Status of fishery resources off the Northeastern United States for 1993. NOAA Tech. Mem. NMFS-F/NEC-101. 140 pp.
- GMFMC 1995. Draft Supplemental Environmental Impact Statement (SEIS): Amendment 8 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic. Draft of 10/25/95, Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council. 84 pp.+3 pp. appendix.
- Goodyear, P. 1995. Mean size at age: an evaluation of sampling strategies with simulated red grouper data. *Trans. Am. Fish. Soc.* 124(5):746-755.
- Helser, T. and R. E. Condrey. 1992. A Monte Carlo-based virtual population simulation for incorporating uncertainty into estimates of spawning potential ratios. Ph.D. Thesis (chapter), LSU, Baton Rouge. 26 pp. + 3 tab., 11 fig.
- Hilborn, R. and C. J. Walters 1992. Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty. Chapman and Hall, N.Y. 570 pp.
- Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. *Fish. Bull.* 81(4):898-903
- Leard, R., B. Mahmoudi, H. Blanchet, H. Lazauski, K. Spiller, M. Buchanan, C. Dyer and W. Keithly. 1995. The striped mullet fishery of the Gulf of Mexico, United States: A regional management plan. Gulf States Marine Fisheries Commission Publ. No. 33.
- Mace, P.M. and M. P. Sissenwine. 1993. How much spawning per recruit is enough? *pp.* 101- 118 *in: S. J. Smith, J. J. Hunt and D. Rivard (eds.) Risk Evaluation and Biological Reference Points for Fisheries Management*. Can. Spec. Publ. Fish. Aq. Sci. 120. 442 pp.

- Mapes, K. A., R. Bejarano, J. F. Burdon and B. McManus. 1998. A biological and fisheries profile for striped mullet, *Mugil cephalus* in Louisiana. La. Dept. of Wildl. & Fish., Office of Fisheries, Fishery Management Plan Series No. 5, Part 1.
- Mahmoudi, B. 1989. Population assessment of black mullet (*Mugil cephalus*) in the eastern Gulf of Mexico. Final Report of Cooperative Agreement (MARFIN) NA86-WC-H-06138. 89 pp.
- Mahmoudi, B. 1991. Population assessment of black mullet (*Mugil cephalus*) in the eastern Gulf of Mexico. Final Report of Cooperative Agreement (MARFIN) NA90-WC-H-MF003. 69 pp.
- Mahmoudi, B. 1992. Update on black mullet stock assessment. Final report submitted to the Florida Marine Fisheries Commission. 58 pp.
- Mapes, K., R. Bejarano J. F. Burdon and L.B. Savoie. 1996. A biological and fisheries profile for striped mullet (*Mugil cephalus*) in Louisiana. La. Dept. of Wildlife and Fisheries, Office of Fisheries. Fisheries Management Plan Series No. 5, Pt. 1. 83 pp.
- Pauly, D. 1980. On the interrelationships between natural mortality, growth parameters, and mean environmental temperature in 175 fish stocks. J. Cons. int. Explor. Mer 39(2):175- 192.
- Restrepo, V. R., J. E. Powers, and S. C. Turner. 1991. Incorporating uncertainty in VPA results via simulation. ICCAT Coll. Vol. Sci. Pap. 35(2)355-361.
- SAS, 1987. SAS/STAT guide for personal computers, Version 6 edition. SAS Inst., Cary, N.C. 1028 pp.
- Shepard, J.A., H. Blanchet, D. Johns and K. Mapes. 1992. A stock assessment and management plan for Louisiana striped mullet (*Mugil cephalus*). Ch. 4-8 in: A fisheries management plan for Louisiana striped mullet, (*Mugil cephalus*). 74 pp.
- Sparre, P. and S.C. Venema. 1992. Introduction to Tropical Fish Stock Assessment, Part 1 - Manual. FAO Fish. Tech. Pap. 306/1, Revision 1. 376 pp.
- Thompson, B. A., J. H. Render and R. L. Allen. 1989. Life history and population dynamics of commercially harvested striped mullet Mugil cephalus in coastal Louisiana. Final Report Board of Regents' Rockefeller Fund Interest Earnings Grant Program. Coastal Fisheries Institute. LSU-CFI-89-01. 80 pp.

- Thompson, B. A., J. H. Render, R. L. Allen and D.L. Nieland. 1991. Fisheries independent characterization of population dynamics and life history of striped mullet in Louisiana. Final Report, MARFIN project NA90AA-H-MF-113. 92 pp.
- Tung, Ih-Hsiu. 1970. Studies on the fishery biology of the grey mullet, *Mugil cephalus* Linnaeus, in Taiwan. pp. 497-504 in: J.C. Marr (ed.) The Kuroshio: a symposium on the Japan current. East-West Center Press, Honolulu. 614 pp.

Table 5.1. Annual commercial and recreational harvest of mullet from Louisiana waters, expressed in pounds. Commercial harvest values from dealer landings reports, recreational harvest from NMFS MRFSS estimates of fish landed plus those discarded dead.

Year	Commercial Harvest (lbs.)	Recreational Harvest (lbs.)	Total Harvest (lbs.)	%Commercial
81	3,051,461	564	3,052,025	99.98%
82	1,533,452	16,546	1,549,998	98.93%
83	1,886,654	0	1,886,654	100.00%
84	3,157,215	2,793	3,160,008	99.91%
85	579,297	7,505	586,802	98.72%
86	2,277,713	52,921	2,330,634	97.73%
87	1,439,425	0	1,439,425	100.00%
88	2,367,106	105,878	2,472,984	95.72%
89	2,413,768	75,287	2,489,055	96.98%
90	2,645,927	296,113	2,942,040	89.94%
91	3,563,137	26,303	3,589,440	99.27%
92	6,214,532	121,274	6,335,806	98.09%
93	11,026,497	185,015	11,211,512	98.35%
94	12,560,261	97,511	12,657,772	99.23%
95	14,545,610	89,551	14,635,161	99.39%
96	8,658,881	217,807	8,876,688	97.55%
97	8,696,475	127,594	8,824,069	98.55%

Table 5.2 - Age-at-length distribution of female striped mullet used in age-length key development. LSU and LDWF data combined. Origin of the data used in development of this key is described in the text.

Length (inches)	AGE									Total Number
	1	2	3	4	5	6	7	8	9	
10	0	0	0	1	0	0	0	0	0	1
11	0	46	57	30	5	0	0	0	0	138
12	0	1	3	0	0	0	0	0	0	4
13	0	6	9	5	1	1	0	0	0	22
14	0	13	28	19	5	1	0	1	0	67
15	3	39	61	61	20	4	0	0	0	188
16	0	38	83	93	31	3	1	0	0	249
17	0	21	77	67	37	8	2	1	0	213
18	0	3	25	46	26	8	1	1	0	110
19	0	0	7	21	21	4	1	0	0	54
20	0	0	0	6	7	10	4	0	1	28
21	0	0	1	1	2	1	1	0	0	6
22	0	0	0	0	0	1	0	0	0	1
ALL	3	167	351	350	155	41	10	3	1	1081

Table 5.3. Analysis of variance of striped mullet catch per effort indices from LDWF seine samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/year/month cell.

SEA=Jan-May

General Linear Models Procedure
Class Level Information

Class	Levels	Values
YEAR	13	1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998
MONTH	5	1 2 3 4 5
AREA	7	1 2 3 4 5 6 7

Number of observations in by group = 2612

General Linear Models Procedure

Dependent Variable: LOGC_E

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	587.79621308	26.71800969	23.18	0.0001
Error	2589	2983.65214124	1.15243420		
Corrected Total	2611	3571.44835433			

	R-Square	C.V.	Root MSE	LOGC_E Mean
	0.164582	188.6548	1.07351488	0.56903650

Source	DF	Type I SS	Mean Square	F Value	Pr > F
YEAR	12	101.16828474	8.43069040	7.32	0.0001
MONTH	4	19.72567945	4.93141986	4.28	0.0019
AREA	6	466.90224889	77.81704148	67.52	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	12	106.37590078	8.86465840	7.69	0.0001
MONTH	4	19.37408400	4.84352100	4.20	0.0021
AREA	6	466.90224889	77.81704148	67.52	0.0001

Table 5.4. Duncan's Multiple Range Test and least square means of striped mullet catch per effort indices from LDWF seine samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/year/month cell.

----- SEA=Jan-May -----

General Linear Models Procedure

Duncan's Multiple Range Test for variable: LOGC_E

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 2589 MSE= 1.152434

WARNING: Cell sizes are not equal.

Harmonic Mean of cell sizes= 199.7304

Number of Means	2	3	4	5	6	7	8	9	10	11	12	13
Critical Range	.2107	.2218	.2293	.2348	.2391	.2426	.2456	.2481	.2503	.2522	.2540	.2555

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	YEAR
A	0.9243	244	1998
A	0.8075	212	1997
B A	0.7924	184	1986
B A	0.7876	213	1996
B C	0.5764	182	1988
D C	0.5109	186	1987
D C	0.4892	201	1994
D C	0.4795	188	1993
D C	0.4561	201	1990
D C	0.4077	204	1992
D C	0.4036	188	1989
D C	0.3477	207	1995
D	0.3216	202	1991

General Linear Models Procedure

Least Squares Means

YEAR	LOGC_E LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0
1986	0.74879978	0.07951713	0.0001
1987	0.48470859	0.07890190	0.0001
1988	0.55234153	0.07975652	0.0001
1989	0.39296177	0.07838984	0.0001
1990	0.46226085	0.07575405	0.0001
1991	0.29463030	0.07565798	0.0001
1992	0.40470092	0.07519820	0.0001
1993	0.44759864	0.07852655	0.0001
1994	0.47972989	0.07577197	0.0001
1995	0.33601210	0.07469066	0.0001
1996	0.78666564	0.07357734	0.0001
1997	0.80263173	0.07377119	0.0001
1998	0.94136189	0.06892288	0.0001

Table 5.5. Analysis of variance of striped mullet catch per effort indices from LDWF gill net samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/gear/year/month cell.

----- SEA=Jan-May BIOLOGICAL GEAR=150' 1 in. bar mono gill -----

General Linear Models Procedure
Class Level Information

Class	Levels	Values
YEAR	13	1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998
MONTH	5	1 2 3 4 5
AREA	7	1 2 3 4 5 6 7

Number of observations in by group = 2942

Dependent Variable: LOGC_E

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	64.67932942	2.93996952	7.72	0.0001
Error	2919	1112.15800197	0.38100651		
Corrected Total	2941	1176.83733139			

R-Square	C.V.	Root MSE	LOGC_E Mean
0.054960	201.2960	0.61725725	0.30664159

Source	DF	Type I SS	Mean Square	F Value	Pr > F
YEAR	12	30.07945034	2.50662086	6.58	0.0001
MONTH	4	0.53633507	0.13408377	0.35	0.8428
AREA	6	34.06354401	5.67725734	14.90	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	12	29.13730958	2.42810913	6.37	0.0001
MONTH	4	0.50487194	0.12621799	0.33	0.8571
AREA	6	34.06354401	5.67725734	14.90	0.0001

Table 5.5 (contd.). Analysis of variance of striped mullet catch per effort indices from LDWF gill net samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/gear/year/month cell.

----- SEA=Jan-May BIOLOGICAL GEAR=150' 1.25 in. bar mono gill -----

General Linear Models Procedure
Class Level Information

Class	Levels	Values
YEAR	11	1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998
MONTH	5	1 2 3 4 5
AREA	7	1 2 3 4 5 6 7

Number of observations in by group = 2454

Dependent Variable: LOGC_E

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	35.06755828	1.75337791	4.66	0.0001
Error	2433	915.20997385	0.37616522		
Corrected Total	2453	950.27753214			

R-Square	C.V.	Root MSE	LOGC_E Mean
0.036902	203.0651	0.61332309	0.30203272

Source	DF	Type I SS	Mean Square	F Value	Pr > F
YEAR	10	12.90337630	1.29033763	3.43	0.0002
MONTH	4	5.66890403	1.41722601	3.77	0.0046
AREA	6	16.49527796	2.74921299	7.31	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	10	11.70409982	1.17040998	3.11	0.0006
MONTH	4	5.99623420	1.49905855	3.99	0.0032
AREA	6	16.49527796	2.74921299	7.31	0.0001

Table 5.5 (contd.). Analysis of variance of striped mullet catch per effort indices from LDWF gill net samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/gear/year/month cell.

----- SEA=Jan-May BIOLOGICAL GEAR=150' 1.5 in. bar mono gill -----

General Linear Models Procedure
Class Level Information

Class	Levels	Values
YEAR	13	1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998
MONTH	5	1 2 3 4 5
AREA	7	1 2 3 4 5 6 7

Number of observations in by group = 2934

General Linear Models Procedure

Dependent Variable: LOGC_E

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	63.00461587	2.86384618	13.26	0.0001
Error	2911	628.88615691	0.21603784		
Corrected Total	2933	691.89077277			

R-Square	C.V.	Root MSE	LOGC_E Mean
0.091062	235.5243	0.46479871	0.19734641

Source	DF	Type I SS	Mean Square	F Value	Pr > F
YEAR	12	5.73090652	0.47757554	2.21	0.0093
MONTH	4	12.46512463	3.11628116	14.42	0.0001
AREA	6	44.80858471	7.46809745	34.57	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
YEAR	12	5.80652353	0.48387696	2.24	0.0083
MONTH	4	12.83083348	3.20770837	14.85	0.0001
AREA	6	44.80858471	7.46809745	34.57	0.0001

Table 5.6. Duncan's Multiple Range Test and least square means of striped mullet catch per effort indices from LDWF gill net samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/year/month cell.

----- SEA=Jan-May BIOLOGICAL GEAR=150' 1 in. bar mono gill -----

General Linear Models Procedure
Duncan's Multiple Range Test for variable: LOGC_E

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 2919 MSE= 0.381007
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 225.9181

Number of Means	2	3	4	5	6	7	8	9	10	11	12	13
Critical Range	.1139	.1199	.1239	.1269	.1293	.1312	.1328	.1341	.1353	.1364	.1373	.1381

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	YEAR
A	0.57684	245	1986
B	0.38356	235	1987
B	0.38304	228	1995
C B	0.33419	217	1996
C B	0.30662	217	1993
C B D	0.29002	224	1992
C B D	0.28348	234	1994
C B D	0.28321	221	1988
C B D	0.26916	209	1991
C D	0.23904	228	1990
C D	0.22665	220	1997
C D	0.22007	227	1989
D	0.16803	237	1998

General Linear Models Procedure
Least Squares Means

YEAR	LOGC_E LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0
1986	0.57442849	0.03951306	0.0001
1987	0.38307193	0.04038820	0.0001
1988	0.27578896	0.04155180	0.0001
1989	0.21688879	0.04099215	0.0001
1990	0.23751806	0.04088752	0.0001
1991	0.25978347	0.04272741	0.0001
1992	0.28238567	0.04126063	0.0001
1993	0.28555041	0.04197466	0.0001
1994	0.27129373	0.04038808	0.0001
1995	0.36989975	0.04092230	0.0001
1996	0.31896170	0.04197957	0.0001
1997	0.22270479	0.04163343	0.0001
1998	0.18098070	0.04024631	0.0001

Table 5.6 (contd.). Duncan's Multiple Range Test and least square means of striped mullet catch per effort indices from LDWF gill net samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/year/month cell.

----- SEA=Jan-May BIOLOGICAL GEAR=150' 1.25 in. bar mono gill -----

General Linear Models Procedure
Duncan's Multiple Range Test for variable: LOGC_E

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 2433 MSE= 0.376165

WARNING: Cell sizes are not equal.

Harmonic Mean of cell sizes= 222.8154

Number of Means	2	3	4	5	6	7	8	9	10	11
Critical Range	.1140	.1200	.1240	.1270	.1293	.1312	.1328	.1342	.1354	.1364

Means with the same letter are not significantly different.

Duncan Grouping		Mean	N	YEAR
	A	0.46551	217	1996
B	A	0.38751	215	1988
B	C	0.33476	227	1989
B	C	0.33041	217	1993
B	C D	0.30206	228	1990
B	C D	0.29467	224	1992
B	C D	0.28544	228	1995
B	C D	0.26426	234	1994
	C D	0.25279	209	1991
	C D	0.22584	235	1998
	D	0.18851	220	1997

General Linear Models Procedure
Least Squares Means

YEAR	LOGC_E LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0
1988	0.39109598	0.04189549	0.0001
1989	0.33772381	0.04073554	0.0001
1990	0.30396767	0.04062855	0.0001
1991	0.25016540	0.04246102	0.0001
1992	0.29610217	0.04100100	0.0001
1993	0.32310041	0.04172043	0.0001
1994	0.26507243	0.04013726	0.0001
1995	0.28327722	0.04066931	0.0001
1996	0.45944921	0.04172834	0.0001
1997	0.19330989	0.04137171	0.0001
1998	0.24697905	0.04016523	0.0001

Table 5.6 (contd.). Duncan's Multiple Range Test and least square means of striped mullet catch per effort indices from LDWF gill net samples. Indices are calculated for all samples taken between January through May, using the natural log of (catch/effort +1) for each station/year/month cell.

----- SEA=Jan-May BIOLOGICAL GEAR=150' 1.5 in. bar mono gill -----

General Linear Models Procedure
Duncan's Multiple Range Test for variable: LOGC_E

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 2911 MSE= 0.216038
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 225.3509

Number of Means	2	3	4	5	6	7	8	9	10	11	12	13
Critical Range	.0859	.0904	.0934	.0957	.0975	.0989	.1001	.1011	.1020	.1028	.1035	.1042

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	YEAR
A	0.28273	235	1987
B A	0.25635	217	1996
B A C	0.23774	234	1994
B D A C	0.21611	220	1988
B D A C	0.21313	209	1991
B D A C	0.20883	240	1986
B D A C	0.19951	216	1993
B D A C	0.18868	228	1990
B D A C	0.18649	227	1989
B D C	0.15842	220	1997
D C	0.14661	228	1995
D C	0.13661	236	1998
D	0.13455	224	1992

General Linear Models Procedure
Least Squares Means

YEAR	LOGC_E LSMEAN	Std Err LSMEAN	Pr > T H0:LSMEAN=0
1986	0.21802710	0.03007449	0.0001
1987	0.30068942	0.03041270	0.0001
1988	0.21872637	0.03135983	0.0001
1989	0.19377531	0.03086739	0.0001
1990	0.19368747	0.03078859	0.0001
1991	0.21340974	0.03217405	0.0001
1992	0.14360737	0.03106957	0.0001
1993	0.20430662	0.03168066	0.0001
1994	0.24906458	0.03041256	0.0001
1995	0.15372938	0.03081483	0.0001
1996	0.26052091	0.03161104	0.0001
1997	0.16773543	0.03135030	0.0001
1998	0.15309572	0.03035620	0.0001

Table 5.7. Estimation of fishing mortality rates, yield per recruit, spawning stock biomass per recruit (in terms of egg production), percent spawning potential ratio, and the yield per recruit compared to the maximum possible, given the natural mortality rates listed.

M=0.3	F - Ratio	YPR	SSB/R	%SPR	%YPR	
F-max =	0.6910	84.0504	444,007	39.22%	100.00%	Benchmarks
F0.1 =	0.2934	76.0648	631,945	55.82%	90.50%	
SPR20% =	3.3158	66.2904	226,433	20.00%	78.87%	
SPR30% =	1.2715	80.2173	339,650	30.00%	95.44%	
CURRENT =	1.1653	81.1866	352,888	31.17%	96.59%	Estimate

M=0.4	F - Ratio	YPR	SSB/R	%SPR	%YPR	
F-max =	0.9899	49.0914	256,101	42.47%	100.00%	Benchmarks
F0.1 =	0.3653	42.7894	363,318	60.25%	87.16%	
SPR20% =	7.2859	38.4639	120,602	20.00%	78.35%	
SPR30% =	2.5066	45.2255	180,903	30.00%	92.13%	
CURRENT =	1.0653	49.0581	249,169	41.32%	99.93%	Estimate

M=0.5	F - Ratio	YPR	SSB/R	%SPR	%YPR	
F-max =	1.4181	29.8984	156,250	45.45%	100.00%	Benchmarks
F0.1 =	0.4789	25.7635	217,808	63.36%	86.17%	
SPR20% =	14.4527	23.7724	68,757	20.00%	79.51%	
SPR30% =	4.9132	27.4744	103,136	30.00%	91.89%	
CURRENT =	0.9653	29.4141	176,785	51.42%	98.38%	Estimate

M=0.6	F - Ratio	YPR	SSB/R	%SPR	%YPR	
F-max =	2.2955	18.9355	95,930	46.32%	100.00%	Benchmarks
F0.1 =	0.6110	16.0371	137,617	66.44%	84.69%	
SPR20% =	25.8062	15.1815	41,424	20.00%	80.17%	
SPR30% =	8.9894	17.9328	62,137	30.00%	94.70%	
CURRENT =	0.8653	17.4667	126,054	60.86%	92.24%	Estimate

January 16, 1999

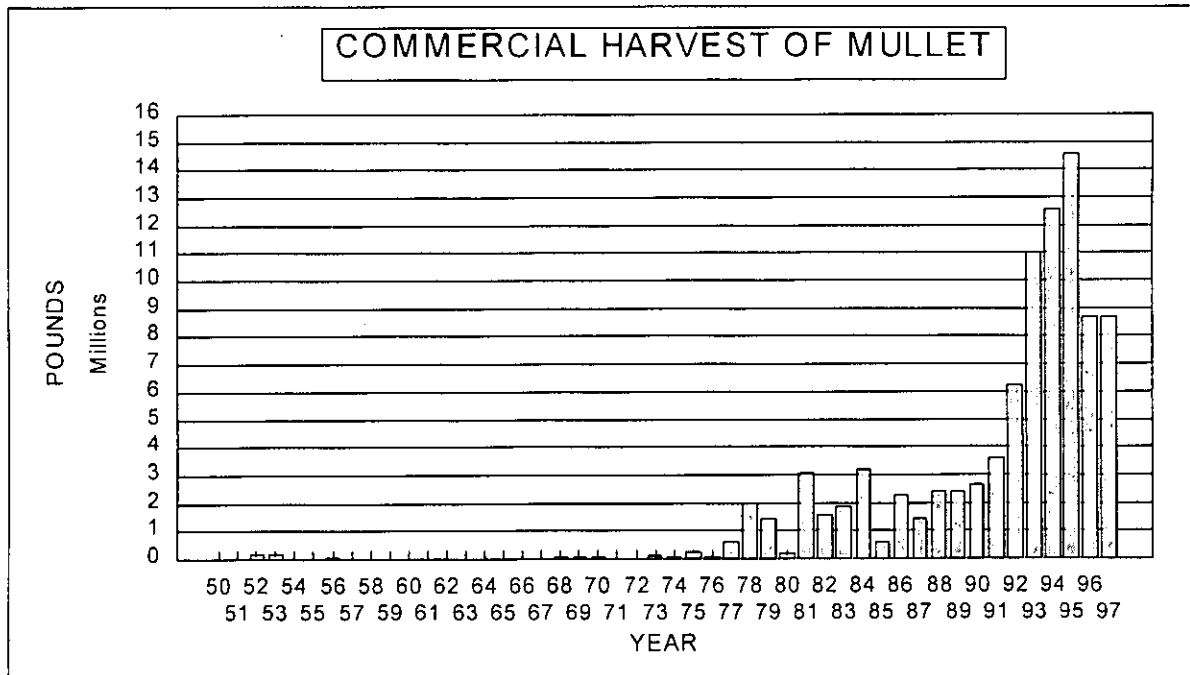


Figure 5.1. Historic commercial landings of striped mullet from Louisiana waters by calendar year. Source: NMFS commercial landings database.

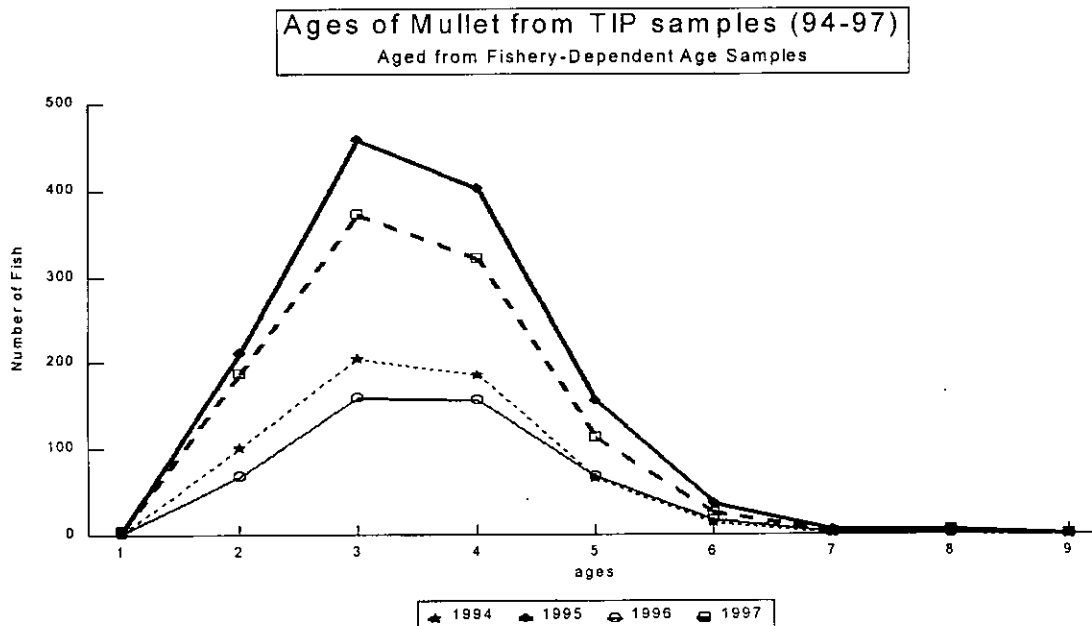


Figure 5.2. Age frequency of mullet from Trip Intercept Program samples in fishing years 1994-1997, aged from age-length key.

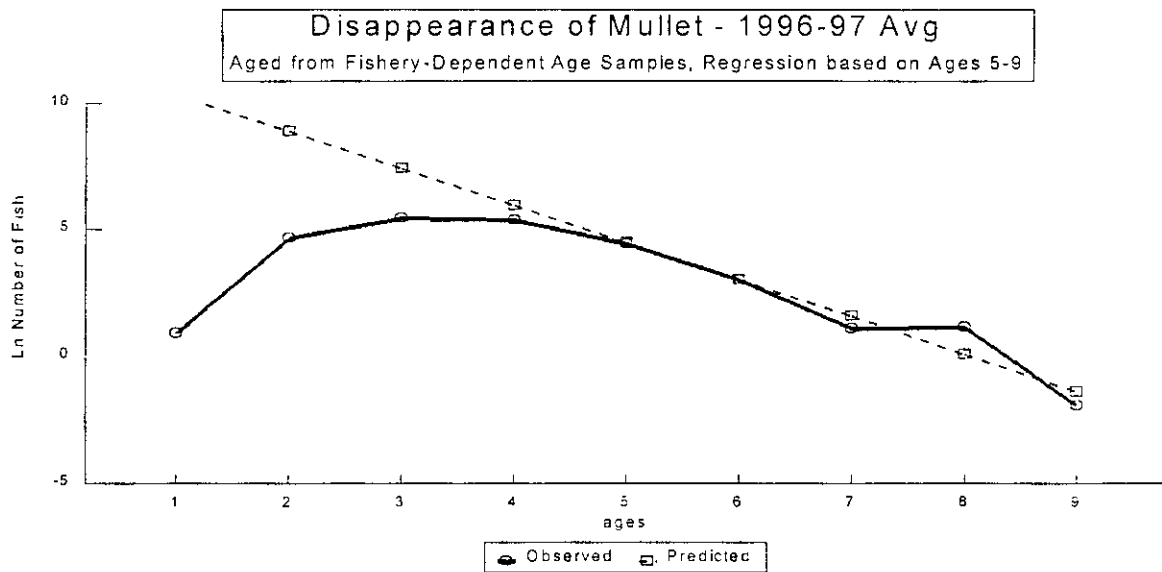


Figure 5.3. Natural log of the 1996-97 age frequency of striped mullet harvest, with the fitted disappearance rate.

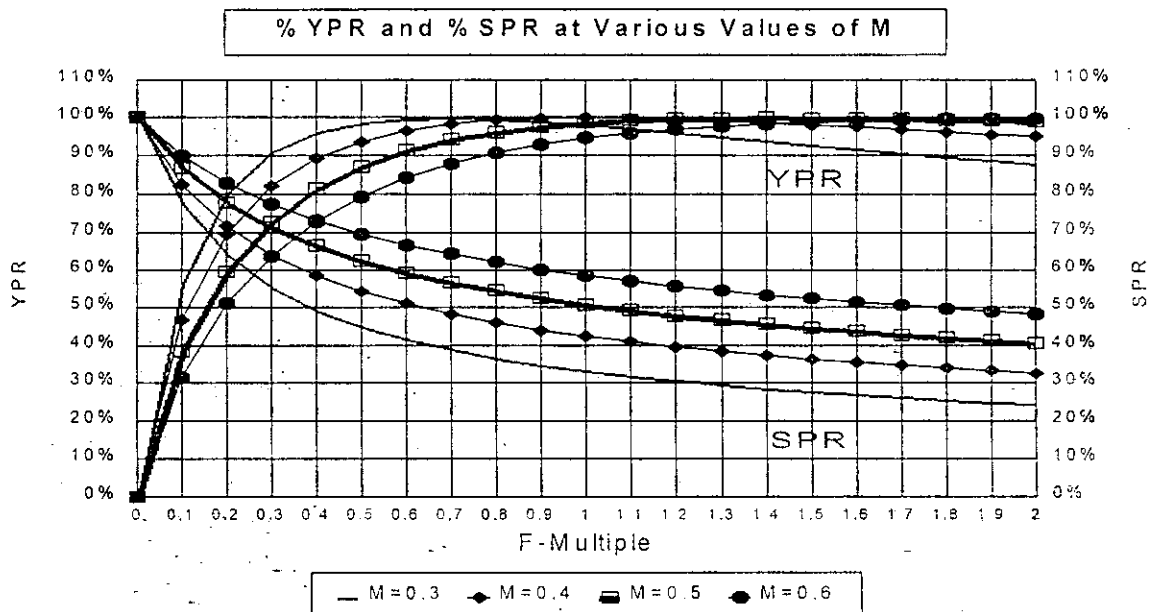


Figure 5.4 Percent annual yield per recruit and spawning potential ratio for striped mullet in Louisiana, at various levels of natural mortality. The value of $M=0.3$ is the most conservative basis from which to estimate the condition of the stock.

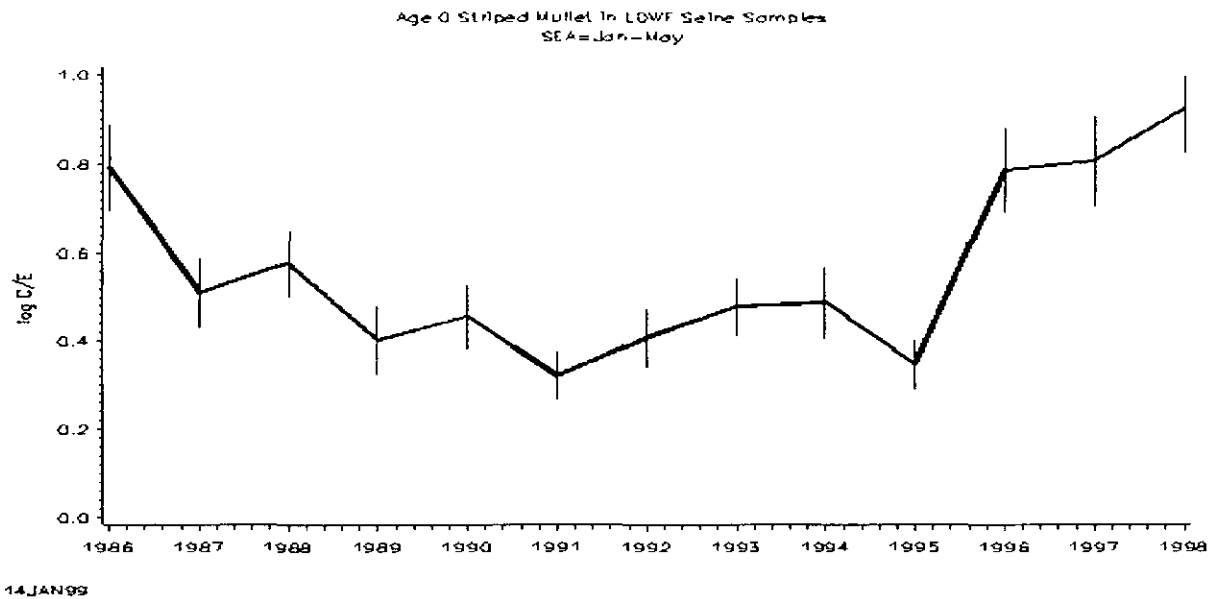


Figure 5.5. Natural log of catch/effort of young-of-the-year striped mullet in statewide fishery-independent bag seine sample, LDWF Monitoring Survey, January through April of each year. Error bars are +/- one standard error of the mean

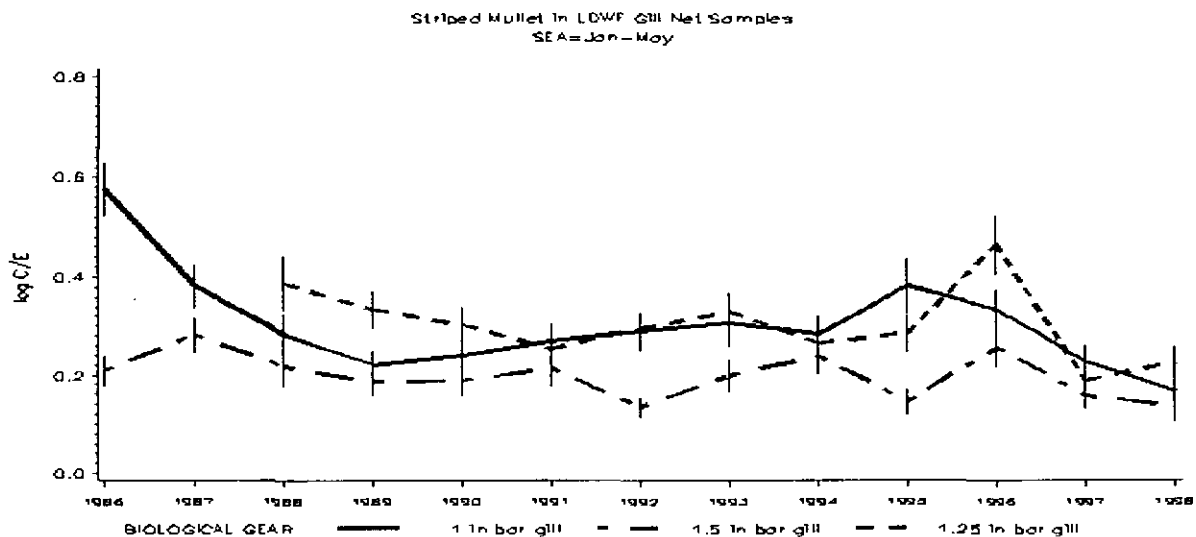


Figure 5.6 Natural log of catch/effort of striped mullet in statewide fishery-independent gill net samples, LDWF Monitoring Survey, January through May of each year. Gill net gears are described by the bar mesh size. Error bars are +/- one standard error of the mean.

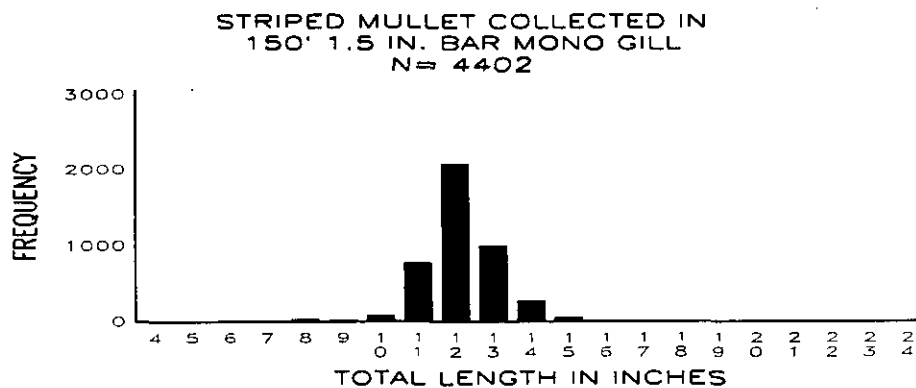
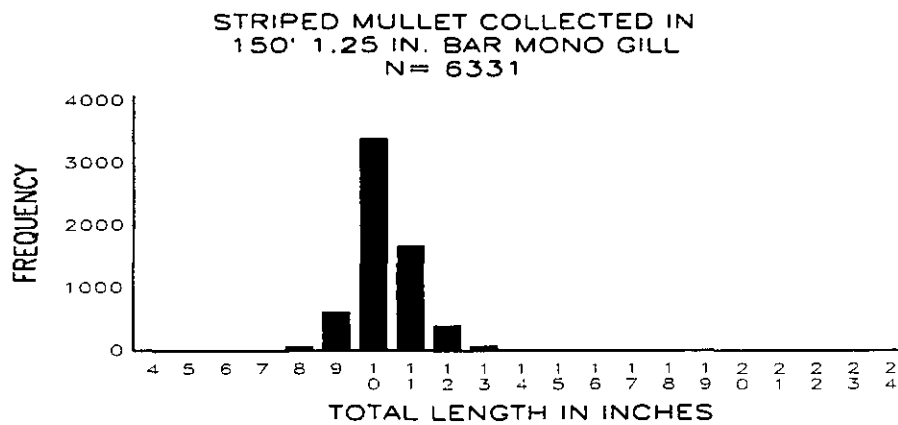
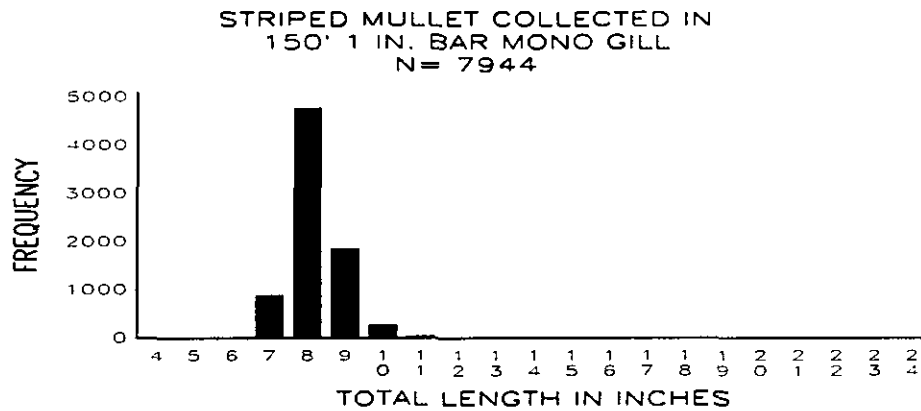
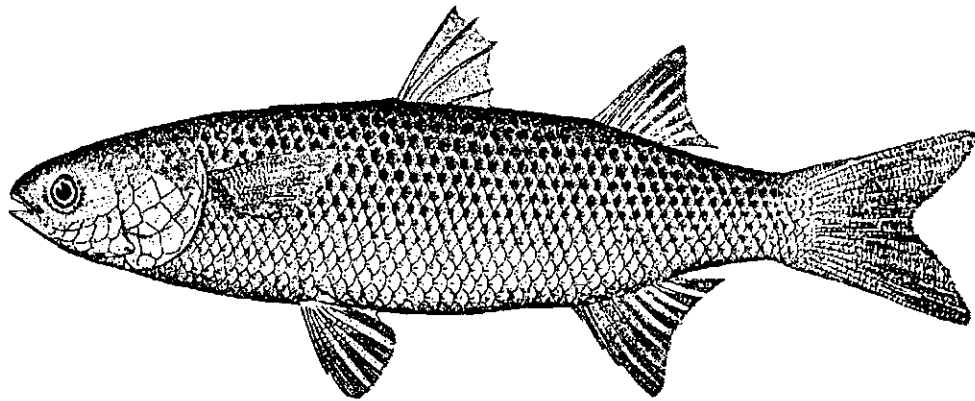
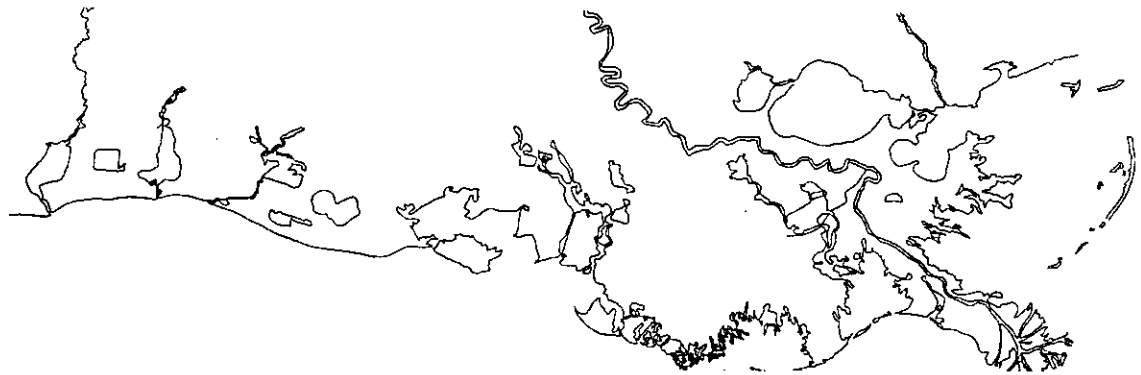


Figure 5.7. Length distribution of striped mullet in 1", 1.25" and 1.5" bar gill net samples, LDWF fishery-independent sampling program.

A BIOLOGICAL AND FISHERIES PROFILE OF
STRIPED MULLET, *Mugil cephalus* IN LOUISIANA



Louisiana Department of Wildlife and Fisheries

Office of Fisheries



Fisheries Management Plan Series

Number 5, Part 1

1999

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES

BATON ROUGE, LOUISIANA

A BIOLOGICAL AND FISHERIES PROFILE FOR STRIPED MULLET,

Mugil cephalus IN LOUISIANA

by

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The drawing of striped mullet on the cover was downloaded from an internet copy of Massey and Harper (1993) who digitized the figure from Evermann (1899).

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1.0 INTRODUCTION

This document presents the most recent available information regarding the biology of the striped mullet *Mugil cephalus*, a description of the Louisiana fishery, assessment of the current status of the stock in the State, management goals and specific management recommendations. The mullet fishery in Louisiana is still in a developmental stage commercially, and updates may be necessary to adequately document changes in fishing methodology, markets, or other factors.

Striped mullet were not targeted commercially in Louisiana until the mid 1970's. An abundance of more desirable species of fish in Louisiana waters has served to limit the expansion of the striped mullet food fishery. Recent creel surveys and historical information indicate that striped mullet are seldom used by the recreational fishery except as a bait species.

The average annual landings of mullet from 1978-1994 was 3,494,296 pounds (1,572,433 kg). This was a significant increase over landings prior to 1978 and was, in part, a response to an increased demand for mullet roe.

As commercial landings grew, concern was expressed by recreational fishers that the removal of large quantities of mullet would affect the populations of some recreationally targeted species. In its present state, the commercial mullet fishery is probably not affecting food supplies for the predatory fishes.

1.1 Status of the Fishery

There currently is little recreational fishery effort directed toward mullet in Louisiana. The commercial fishery has expanded in recent years and is currently capable of harvesting all mature year classes; however, due to the current market, roe mullet are mainly being targeted. The commercial mullet fishery has been impacted by House Bill 1316 passed during the 1995 Louisiana Legislative Session. The following is but a part of the legislation influencing mullet. The fishery is now open on the third Monday of October each year and closes on the third Monday in January that is the roe season for this species. No night fishing is allowed and no fishing from 5:00 a.m. Saturday through 6:00 p.m. Sunday. Mullet may not be taken outside this period.

A review of National Marine Fisheries Service (NMFS) records, indicate landings of striped mullet as early as 1930. Although there were significant landings in certain years from 1930 through 1976, yearly landings during this period were generally low (Figures 3.2 and 3.3). Following the development of the roe market in the mid 1970's, landings increased dramatically between 1977 and 1989 (Fig. 3.4).

The striped mullet fishery has seen tremendous growth in the early 1990's. Harvest figures for 1996 show a decline from the peak years of that period. Monitoring of harvest, recruitment, and relative stock size through the Marine Finfish Monitoring Program is intended to ensure that current and future harvest levels are sustainable.

1.2 Problems of the Fishery

The commercial striped mullet fishery has been undergoing a fairly rapid expansion since 1976. This expansion has been largely due to the increased demand for mullet roe. Since roe mullet are the primary target of commercial fishers, harvesting has been directed toward larger fish.

The fact that commercial fishers target roe mullet intensifies competition during spawning months. The spawning season in the northern Gulf of Mexico extends from October through March. During this period large schools of mullet are found throughout coastal Louisiana, both inshore and nearshore. Spawning habits of the striped mullet concentrates the fish, thus making the fishery highly visible during the peak months.

2.0 STRIPED MULLET BIOLOGY

The striped mullet belongs to the family Mugilidae. According to Randall (1968), mullet are thick-bodied, blunt-snouted fishes with two short-based dorsal fins. Mullet have a mouth shaped like an inverted V when viewed from the front. The teeth are minute. Most members of the family have a thick-walled gizzard-like stomach and a very long intestine.

2.1 Nomenclature and Taxonomy

Accepted classification of the mullet is that of Greenwood *et al.* (1966). Taxa higher than Class are not included here.

Class: Osteichthyes
Superorder: Acanthopterygii
Order: Perciformes
Suborder: Mugiloidei
Family: Mugilidae
Genus: *Mugil*
Species: *Mugil cephalus*

The valid name for the striped mullet is *Mugil cephalus* (Linnaeus 1758). The following synonymy is adapted from Jordan and Evermann (1896).

Mugil cephalus Linnaeus, 1758
Mugil alba Linnaeus, 1766
Mugil tang Bloch, 1794
Mugil plumieri Bloch, 1794
Mugil lineatus Mitchell, MS; Cuvier and Valenciennes, 1836
Mugil rammelsbergii Tschudi, 1845
Mugil berlandieri Girard, 1859
Mugil guntheri Gill, 1863
Mugil mexicanus Steindachner, 1875
Mugil albula Jordan and Gilbert, 1883
Mugil cephalus Jordan and Swain, 1884
Querimana gyrans Jordan and Gilbert, 1884

The striped mullet is the most abundant of the three members of the family Mugilidae found in waters of the northwestern Gulf of Mexico (Hoesle and Moore 1977). The relationships within the family have been outlined by Ebeling (1957, 1961).

Legrande *et al.* (1976) collected specimens of *Mugil cephalus* and white mullet, *M. curema*, in southeastern and southwestern Louisiana. They discovered that the chromosome number differed between *M. curema* and seven other known members of the family Mugilidae. *M. curema* had a

diploid complement of 28, including 10 pairs of metacentric, 2 pairs of subtelocentric, and 2 pairs of acrocentric chromosomes, while all other known Mugilidae had a diploid complement of 48, none of which are metacentric. The metacentric chromosomes of *M. curema* were reported to be about twice the size of unpaired elements in either *M. curema* or *M. cephalus*. They used this observation as evidence that the karyotype of *M. curema* was derived by centric fusion from an ancestral group with a chromosome complement similar to that of *M. cephalus*.

Striped mullet is the preferred common name recognized for *Mugil cephalus* by the American Fisheries Society (Robins *et al.* 1980). Other common names include common mullet, grey mullet, black mullet, jumping mullet, whirling mullet, molly, callifavor, menille, mulle' (La. French, phonetic spelling), cefalo, macho, machuto, liza, lisa, and lisa cabezuda (Spanish of various regions) (Jordan and Evermann 1896, Gowanloch 1933, De Sylva *et al.* 1956, Hoese and Moore 1977, Collins 1985).

2.2 Distribution

Mugil cephalus is found in coastal waters, roughly between 42 degrees North and 42 degrees South. It is present in the western Atlantic from Brazil to Nova Scotia (Hoese and Moore 1977) but absent from the Bahamas and most of the West Indies and Caribbean (Robins *et al.*, 1986).

2.2.1 Louisiana Distribution

In Louisiana the striped mullet can be found in rivers, lakes, bays, bayous, and canals as well as along the coast in fresh, brackish and salt water. Generally, mature adults move offshore to spawn during the fall and winter months but later return.

Based on numerous otter trawl, gill, seine and trammel net samples taken across coastal Louisiana by the Dept. of Wildlife and Fisheries, the striped mullet was by far the most abundant mullet species caught. White mullet (*Mugil curema*) catch was very small (Judd Pollard, DWF, pers. comm.), and mountain mullet (*Agonostomus monticola*) has only rarely been taken in Louisiana waters (Suttkus 1956).

2.3 Stock Identification

Rivas (1980) reported that, based on tagging studies, striped mullet from the Gulf of Mexico are separated from those of the eastern coast of Florida and farther north. These findings were later confirmed by racial studies based on meristic and proportional characters. No data were found to show whether a break exists between the Gulf and the Caribbean Sea around the outer tip of the Yucatan Peninsula. There is basically one stock of striped mullet in the Gulf of Mexico with small variation at a few alleles (Lazuski *et al.* 1989). Campton and Mahmoudi (1991) stated that no protein electrophoretic evidence for genetic substructuring of striped mullet populations was found

in allozyme polymorphisms between the east and west coasts of Florida based on spatial patterns of variation. In general, allele frequency variations among samples within locales were as great or greater than the variation among locales. Thompson *et al.* (1991) also found no differences in enzyme polymorphisms in striped mullet collected from various locations across Louisiana, or between those areas and mullet from Pascagoula River, Mississippi, Mobile Bay, Alabama, and Charleston Bay, South Carolina. They did note differences between S.E. U.S. mullet and specimens from Oahu and Hilo, Hawaii.

Crosetti *et al.* (1994) did demonstrate significant differences between populations in worldwide sampling of mitochondrial DNA genotypes. They concluded that little or no genetic exchange occurs at the present time between widely scattered locales sampled on a global scale. They only examined striped mullet from North Carolina out of the Western Atlantic, so this data is of limited use in attempting to define sub-populations at a local level except through analogy. They found that different areas within major ocean basins were relatively similar, and that the major differences that they found were between populations in different basins.

Rossi *et al.* (1998a) looked at allozyme variation at 27 presumptive gene loci in ten globally diverse populations. They found that heterozygosity ranged from 0.018 in Hawaii to 0.081 in Florida and that the average was 0.050. The proportion of polymorphic loci showed a similar trend. Rossi *et al.* (1998) also found that several populations were characterized by fixed allelic differences. Additionally, the estimated gene diversities were very high, i.e., the allele frequency variation among populations was 68%. Moreover, estimated rates of gene flow were high among Mediterranean populations ($Nm=7.26$), and also between Mediterranean and East Atlantic populations ($Nm=2.86$). The rates were extremely low between non-contiguous populations within the Indian, Pacific and Atlantic Oceans, i.e. Nm ranged 0.03-0.05.

Rossi *et al.* (1998b) also used comparative allozyme analysis on five species of Mugilidae and found that the high levels of genetic divergence among separate populations of *Mugil cephalus* are small in comparison to the interspecific differences. However, the considerable genetic differentiation among populations, in combination with the extremely reduced, or nonexistent, current gene flow, suggest that at least some these populations are at a stage of incipient speciation.

Schooling behavior of mullet presents some interesting questions regarding the genetic relation among individuals within schools. A significant result at one locus ($P<0.001$) regarding homogeneity of allele frequencies suggests some form of non-random demographic structuring may be associated with schools of mullet (Mahmoudi 1989).

2.4 Morphology

The following description is summarized from Martin and Drewry (1978), who compiled data from a wide variety of sources, with supplemental material from De Sylva *et al.* (1956) and Fahay (1983).

D. IV-I,7-8; A. III,8; C. 7+7, procurent rays 7-8+7-8; V. I,5; lateral line scales 37-43, vertebrae 11+13 or 12+12, first interneural bifurcate above seventh vertebra; gill rakers 24-36+50-76, numbers increasing with size; primary teeth uniserial, simple, 57-101 in upper jaw, 97-149 in lower jaw; secondary teeth in bands, bicuspid, numerous, number increasing with size; no teeth on vomer or palatines.

Head 25.4-27.7; maxillary 7.0; interorbital width 9.3-10.4; body depth 25.4-26; first predorsal 50.8-57.1; second predorsal 74.6; preanal 73.0-73.5; prepelvic 39.4-39.5; first dorsal base 12.8-13.3; second dorsal base 10.6; second dorsal height 14.3-14.4; anal fin height 15.0-15.5; pectoral length 17.3-17.6; pelvic length 15.2-15.3; all being percent standard length (SL) means for 2 samples of 25 specimens (DeSylva *et al.* 1956)

Body robust, moderately elongate, compressed; lower profile strongly curved from snout to caudal peduncle, upper profile less curved, but arched slightly from snout to first dorsal fin origin; body oval in cross section; caudal peduncle rather strongly compressed. Head massive, somewhat broader than deep; interorbital flat, short, and broad, its width more than twice eye diameter; snout shorter than eye, blunt or rounded anteriorly with a strong taper in dorsal view; some scales on top of head slightly enlarged; anterior and posterior nostrils widely separated. Mouth moderate, oblique, jaws weak; lower jaw included; maxillary hidden when jaws closed, its posterior end moving forward when mouth opened; lower lip with a thin edge directed horizontally forward or nearly so. Gape somewhat broader than deep. Gill openings wide, gill membranes free of the isthmus; gill rakers numerous, long, slender, and close-set; pseudobranchiae large. A prominent adipose eyelid almost obscuring eye, covering preorbital anteriorly and extending almost twice as far posteriorly, leaving a narrow slit over pupil. Scales moderate, cycloid or feebly ctenoid. Lateral line inconspicuous. Pectoral fins above midline, at level of eye, originating about length of head behind eye; tips pointed, not reaching first dorsal origin; a distinctly enlarged scale in pectoral axil; pelvic fins subabdominal; origin of first dorsal fin over pelvics; first dorsal spine longest, others graduated, last spine about half as long as first; origin of second dorsal fin slightly behind anal origin; upper margin concave, longest ray nearly same length as longest spine of first dorsal; anal fin about same size and shape as second dorsal but margin less concave; caudal deeply forked, longest rays nearly as long as head, shortest about half as long. Fine scales extending onto caudal fin and some on anterior rays of second dorsal and anal.

Pigmentation: Color varies with habitat and salinity, in fresh water very dark dorsally with overlay of dirty brown or bluish color, dull white ventrally; in marine waters dorsum olive green, sides silvery, venter off-white. In general, dorsum grayish olive, grayish blue, grayish brown, bluish brown or dark blue; shading to silvery white on sides and white or pale yellow ventrally; many brown spots on sides, organized into rows along scale centers on upper half, forming 5 to 10 dark longitudinal stripes on upper scale series down to about the tenth, lower band not extending beyond anal origin. Sometimes a terminal caudal bar in migrating adults. Fins dusky, minutely dotted with

black, except pelvics, which are a pale yellowish color; pectoral black at base of upper rays and distally, with a narrow pale margin, inner surface almost black; margin and last few rays of anal fin pale. A dark blue streak or spot in the axil of pectoral. A golden ring around the iris.

2.4.1 Larvae and Juveniles

Development of the larval stage was described from hatching by Yashouv and Berner-Smsonov (1970) from Mediterranean specimens. Anderson (1958) described development from 4.0 millimeters (mm) larvae through the prejuvenile stage from material taken off the southeastern coast of the United States. Grant and Spain (1975) provided data on developmental morphology from the prejuvenile stage to adult. Ditty and Shaw (1996) provided characters for separating *Mugil cephalus* from *M. curema* and *Agonostomus monticola* larvae.

According to Thomson (1963), larval mullet average 2.4 mm total length (TL) at hatching. They lack a branchial skeleton, pectoral as well as pelvic fins, and even a mouth. Clearly noticeable jaws, organized internal organs, and developing fin buds can be seen in 5 day old specimens (approximately 2.8 mm in length). Meristic and morphological growth and development continue until the fish are approximately 16-20 mm SL. At this point they move to inshore waters and estuaries (Kilby 1949, Anderson 1958). The migrating *Mugil cephalus* have 2 spines and 9 rays in the anal fin (the "Querimana stage") until they grow to 35-45 mm SL. At this size, the first ray fuses into a third spine, the adipose eyelid becomes visible and the fish is considered a juvenile (Anderson 1958).

Ditty and Shaw (1996) noted that *Mugil cephalus* >6 mm SL (standard length) can be separated from *Mugil curema* and *Agonostomus monticola* by total number of anal fin elements. (*M. cephalus* has 11, *M. curema* and *A. monticola* have 12). *Mugil cephalus* and *M. curema* also lack pigment on the second dorsal fin until >25 mm SL.

2.4.2 Adults

Distinctive characters stated by Fischer (1978) are as follows: "Body rather stout. Head broad, interorbital area flat; head length 27-29 percent of standard length; fatty (adipose) tissue covering most of eye; lips thin, terminal; lower lip with a high symphysial knob; hind end of upper jaw just reaching vertical from anterior rim of eye; teeth labial, fine, 1 to 6 rows in upper lip, 1 to 4 in lower, outer row unicuspid, inner rows usually bicuspid; preorbital slender, filling only half the space between lip and eye. Origin of first dorsal fin nearer to tip of snout than to caudal fin base; second dorsal fin origin on a vertical from between a quarter and a half along anal fin base; pectoral axillary scale 33 to 36 percent of pectoral fin length; pectoral fin 66 to 74 percent of head length; anal fin with 8 (very rarely 7) soft rays. Scales in lateral series 38 to 42; second dorsal and anal fins lightly scaled anteriorly and along base.

The color of the striped mullet is olive green on back, silvery on sides, shading to white below; 6 or 7 indistinct longitudinal brown bars on flanks; a dark purplish blotch at base of pectoral fin".

2.5 Reproduction

2.5.1 Age, Length, and Weight at First Spawn

It has been suggested that portions of some populations of *Mugil cephalus* can become mature by one (males) to two (females) years of age (Jhingran and Mishra 1962). Thompson *et al.* (1991) observed that male and female Louisiana striped mullet were generally mature at age two, although some females were not mature until age three. Collins (1985), using data from Broadhead (1953, 1958) and Rivas (1980), reported that mullet mature from 200-300 mm SL, with females maturing at a slightly larger size than males. Although some fish reach maturity in their second year, most mature in three. Broadhead (1953) showed a weight-length graph of spawning and non-spawning Florida mullet in 1951: the minimum length and weight for spawning females was 276 mm and about 305 grams; for males it was 286 mm and approximately 330 grams.

Thompson *et al.* (1990) used the criteria that maturity is reached when 50% of the individuals in a population develop functional gonads and stated Louisiana striped mullet males mature around 200 to 220 mm fork length (FL) and females around 220 to 230 mm FL. All their specimens less than 160 mm FL were immature and indistinguishable sexually while all males over 280 mm FL and all females larger than 290 mm FL were mature.

2.5.2 Fecundity

Futch (1966) stated that adult females produced from 1.2 to 2.7 million eggs in a single spawning, whereas Broadhead (1953) reported estimated fecundity between 0.5 to 2.0 million eggs, depending on the size of the female. Shehadeh *et al.* (1973) calculated a fecundity value of 648 plus or minus 62 eggs/g. of body weight.

Fecundity estimates for 67 Louisiana specimens ranged from 2.7×10^5 to 3.7×10^6 eggs per individual (Thompson *et al.* 1990). Thompson *et al.* (1991) stated fecundity increased proportionately to body size. Fecundity of an individual correlated well with standard length ($F = 5.6 \times 10^{-3} (SL)^{3.14}$, $r^2 = 0.85$) and fork length ($F = 5.6 \times 10^{-3} (SL)^{3.14}$, $r^2 = 0.85$). Relative fecundity (expressed as the number of eggs per gram of eviscerated body weight) ranged from 798 to 2616 eggs/gram from fish 290 to 568 mm FL.

Ovaries from female Louisiana striped mullet sampled from February through August possessed only resting primary growth oocytes (Thompson *et al.* 1990). This agreed with Abraham *et al.* (1966) who also noticed a long resting non-reproductive period for striped mullet in Israel.

Mean girth of female Louisiana striped mullet increased 11% between September and November (Thompson *et al.* 1989). This increase in mean girth was strongly associated with ovary maturation and development. Thompson *et al.* (1990) stated gonadosomatic index values supported histological development data showing Louisiana's striped mullet reached maximum reproductive development during November and December.

Studies by Tamura *et al.* (1994) determined that brackish-water females produced the greatest number of fertilized eggs per spawn followed by females maturing in seawater, with the lowest number of fertilized eggs obtained from females maturing in freshwater. The rate of oocyte growth from females maturing in seawater and brackish water did not differ significantly, however, the rate of oocyte growth from females maturing in freshwater was found to be significantly slower than that of the other salinity groups.

2.5.3 Season and Duration of Spawn

The spawning season in the northern Gulf of Mexico generally extends from October through February or March (Anderson 1958, Hoese 1965, Ditty and Shaw 1996). Striped mullet in Louisiana were observed entering the spawning season in late September and October by Russell *et al.* (1986). They based their findings on the fact that red-yellow egg material in females and milky white spermatozoan material in males was discharged when pressure was applied near the urogenital opening. Maximum gonad maturation and development extended from late fall to mid winter, and was concentrated in Louisiana between early November and early January (Thompson *et al.* 1990, 1991; Render *et al.*, 1995). Ditty and Shaw (1996), based on the number and length of *M. cephalus* larvae in their collections, estimated that spawning is completed by late February.

Thomson (1955) reported that some females in Australia spawn only in alternate years. Shireman (1975) found evidence for this in Louisiana freshwater areas and implied this could also be the case for other mullet in U.S. waters. Render *et al.* (1995) described three conditions of anomalous ovarian development in Louisiana striped mullet, producing unusually low gonosomatic index (GSI) values. These anomalous conditions included (1) ovaries with arrested oocyte development at the cortical alveolar stage, (2) very small ovaries with low numbers of normal oocytes undergoing development, and (3) diseased ovaries, with atresia of advanced oocytes and a proliferation of red blood cells and intercellular material. Presence of these types of conditions could have led Thomson (1955) and Shireman (1975) to their conclusions regarding spawning in alternate years, since a portion of the population examined by those researchers would have appeared to not be developing ovaries for the incipient spawn. Shireman (1975) reported atretic oocytes in some ripe female mullet taken in freshwater areas in Louisiana, but did not mention the other characteristics described by Render *et al.* (1995).

Oocyte development patterns reported by Thompson *et al.* (1991) and Render *et al.* (1995) indicated that striped mullet are isochronal spawners that possess synchronous oocyte maturation. These researchers reported that in September, a small number of oocytes progressed to the cortical alveolar and early vitellogenic stages, while most oocytes remained in the primary stage. During October, ovaries contained a synchronous group of developing vitellogenic oocytes, while earlier

stage oocytes disappeared, either through maturation or atresia. Ovaries in the vitellogenic stage were found from early November through early January. No hydrated oocytes nor ovaries with post-ovulatory follicles were found in Louisiana coastal estuarine waters (Render *et al.* 1995).

The duration of spawn seems to be short. Within a week after the spawning migration, fishermen observed spent male and female mullet in their catches. In addition, Leard (1995) mentioned an unpublished tagging study by the University of Miami that found two tagged mature mullet that were re-collected as spent fish within fourteen days of being tagged at the same location where they were set free. These findings suggest that the spawning process is not long, that the fish may not swim far, and that they may return to the same place.

Thompson *et al.* (1989) found that by February, primary stage oocytes in Louisiana striped mullet were dominant, indicating cessation of reproductive activity and a return to resting stage ovaries. Cessation of reproductive activity was further evidenced by an increased proportion of atretic mature oocytes during February.

Thompson *et al.* (1989) measured egg diameters of leading stage oocytes of Louisiana striped mullet through the reproductive season and found mean egg diameter increased from 0.21 mm in September to 0.56 mm in early November. They stated egg diameter from November to late December appeared to reach a plateau with diameters from 0.53 to 0.56 mm and then decreased towards February (0.19 mm). Terminal mean oocyte diameter was not reported since they did not observe oocytes in hydrated condition (Thompson *et al.* 1989). Oocyte diameter before spawning was reported by Pien and Liao (1975) as 0.60 to 0.70 mm, increasing to 0.90 to 0.95 mm during hydration.

2.5.4 Temperature, Photoperiod, and Habitat

There have been no reports of precise water temperatures or salinities associated with mullet spawning in the wild. However, Tung (1970) reported that the best temperatures from which to catch migrating spawners ranged from 21-25 degrees centigrade (°C). Kuo *et al.* (1974) discovered that the temperature most favoring the completion of oogenesis in captive *Mugil cephalus* was 21° C. Sylvester *et al.* (1975) were able to spawn striped mullet in the laboratory by hormone induction between 22.8-23.5° C. The egg survival was greatest at the highest salinity tested, 32 ppt (parts per thousand). Lee *et al.* (1992) successfully produced spawning of *Mugil cephalus* in 100% seawater (32-34 ppt) and 50% seawater (15-17 ppt), but the number of fertilized eggs was significantly lower in 50% seawater. They found that sperm motility varied with salinity. No motility was observed below 13.8 ppt, variable motility was seen between 14-17 ppt and motility was consistently induced at salinities greater than 17 ppt.

A study by Dindo *et al.* (1978) reported that when the natural photoperiod is shortening (less than 12 hours) and the temperature falls to approximately 20° C in September and October, there is a concurrent initiation of rapid gonadal growth and reproductive readiness.

The habitat in which mullet spawn has been researched by many investigators. Mullet have been reported to spawn inshore (Breder 1940), along beaches (Gunter 1945), 8 to 32 kilometers offshore (Broadhead 1953), and in water deeper than 40 meters (Anderson 1958). Arnold and Thompson (1958) documented mullet spawning 65 to 80 km offshore in the Gulf of Mexico in water 1000-1800 meters deep. Major (1978) reported that mullet mostly spawn in relatively deep, cool coastal waters. Fischer (1978) stated mullet form large aggregations during spawning, which takes place in the ocean, near the surface, over deep water toward the edge of the continental shelf. Collins (1985) declared that mullet spawn over a wide range of coastal waters but that most spawn offshore. Robins *et al.*, (1986), stated that all individuals spawn offshore. The current consensus is that most mullet spawn offshore. Earlier reports of inshore spawning may have been due to the speed of the offshore movement and spawn.

Thompson *et al.* (1990) indicated that the absence of post-vitellogenic oocytes in their samples supported the contention that striped mullet spawn offshore (Arnold and Thompson 1958, Greeley *et al.* 1987). Oocytes reach a terminal vitellogenic oocyte diameter and then arrest development until movement offshore occurs (Thompson *et al.* 1990). Further evidence of offshore spawning is reflected in the fact that no post-ovulatory follicles were observed histologically from striped mullet collected in inshore estuarine waters (Thompson *et al.* 1990). Post-ovulatory follicles can be seen historically for a relatively short time (Hunter and Goldberg 1980, Hunter and Macewicz 1985) after spawning and can be used to give direct evidence of spawning (Thompson *et al.* 1989).

2.5.5 Courtship and Spawning Behavior

According to Shireman (1975), mature mullet frequently form large schools and swim offshore to spawn in the fall and winter. Sexually mature fish that live in freshwater either resorb their gonads or move to the sea to spawn. Peterson (1976) observed that swimming speed during migration is much greater than that predicted to be energetically optimal, possibly because of the augmented hydromechanical efficiency provided by schooling and the selective force of heavy predation during spawning migrations.

According to Futch (1966) eggs are discharged into the water and nearby males fertilize them. Arnold and Thompson (1958) reported apparent spawning of striped mullet at night in the Gulf of Mexico from visual observation while drifting in 755 fathoms (1381 meters) of water as follows:

"In a typical group, the males, noticeably smaller and more slender, maintained positions slightly behind what was ostensibly a female. Five or six times while they remained in view, one or more of the males would quickly move up beside or below the female, nudging and pressing against her abdomen with head and body. Often during this action the individuals thus engaged would quiver and cease swimming momentarily, sometimes rising to the surface. The unoccupied males swam rapidly back and forth in the immediate vicinity until they in turn behaved in a similar fashion."

Thompson *et al.* (1991) examined the first record of an hermaphroditic striped mullet in spawning condition taken in U. S. waters (near shore off Mississippi). That this mullet could act functionally as both female and male or have the ability of self-fertilization could not be completely discarded (Thompson *et al.* 1991).

2.5.6 Incubation

Thomson (1963) described *Mugil cephalus* eggs as buoyant, clear, straw-colored, non-adhesive, and spherical. They averaged 0.72 mm in diameter and hatched approximately 48 hours after being fertilized.

2.6 Age and Growth

According to Rivas (1980) mullet may live four or more years. Shireman (1964) reported mullet up to four years old from Maringouin Bayou, Louisiana in 1961-62. Thompson *et al.* (1991) reported that Louisiana striped mullet have a maximum life span of approximately nine years but relatively few live longer than six years. Thomson (1963) stated the maximum age as 13 years. Bardach *et al.* (1972) stated that mullet reach lengths of 50-55 cm and weights of 1.2-2.0 kg. in 4 to 6 years, but it is unclear whether they are discussing growth in the wild, or in aquaculture situations. Thompson *et al.* (1989) reported that for striped mullet, variability in age at a given length indicated that length is a poor estimator of age. Age validation of striped mullet in Louisiana waters showed a single annulus being formed between April and August (Thompson *et al.* 1989).

Futch (1966) reported that larval mullet (approximately 2.5 mm long) grew into postlarvae in about 7 days. As they increase in size, they move inshore and when they reach a length of 20-30 mm move into the grassy parts of brackish water bays. Within 5 months they grew to 50 mm juveniles. When they were one year old they were about 185 mm. In their second year, at approximately 265 mm, they became available to the commercial fishery.

Fishery-independent seine samples taken by the Department of Wildlife and Fisheries indicate that striped mullet about 20 mm TL were found in November and December, but that more young-of-the-year (YOY) individuals were taken in the 20-50 mm range between January and April. During May and June, relatively few fish less than 30 mm TL were found, and by August, few juveniles remained less than 50 mm TL. The mode of the YOY length frequency was about 70 mm in June, 100 mm by September, and 120 mm by December. Growth rates over the first year of life are apparent in the graphed data (Figure 2.1). During the second spring of life, the fish are less effectively sampled by the seine gear and this, combined with variation in individual growth rates reduces the ease by which growth rates can be distinguished in this figure.

Thompson *et al.* (1990) suggested that Louisiana striped mullet complete much of their yearly otolith growth between July and November, before the reproductive season, and little additional otolith growth takes place during winter and early spring. Even though this is in contrast

to suggestions presented by Cech and Wohlschlag (1975), it is consistent with the notion that mullet undergo somatic growth from July through October, then concentrate on oocyte (or testicular) maturation. Thompson *et al.* (1990) thought the growth stasis found between January and March could be a post-spawning recovery period.

Broadhead (1958) stated females were bigger and grew a little faster than males of identical age. Thompson *et al.* (1991) reported that growth models of Louisiana striped mullet showed significant differences between males and females in both length at age and weight at age. Futch (1966) found a rough correlation between average water temperature and size and age at maturity. Individuals from higher temperature areas matured faster than those from lower temperature areas. Rivas (1980) reported that growth of striped mullet during spring and summer is more than double the growth during fall and winter, and he believed the phenomenon to be related to temperature. He proposed that in the Gulf of Mexico, growth in length gradually slows as the fish become larger, and reaches an asymptote at an average length of 600 mm total length (TL), at probably 5-6 years of age.

Robins *et al.* (1986) reported *Mugil cephalus* to reach a maximum size of 910 mm but added that individuals found are usually less than 510 mm TL. However, a 914 mm TL specimen was found in India (Gopalakrishnan 1971). A striped mullet caught from Florida's west coast was reported to have a fork length of 698 mm and a weight of 4.4 kg and unconfirmed records of 9.1 kg and 6.8 kg have been reported from Mexico and Hawaii, respectively (Topp and Beaumariage 1971). Thompson *et al.* (1991) obtained striped mullet from the U. S. Sabine National Wildlife Refuge (Louisiana) from 483 to 590 mm FL and weights to over 8 pounds (3.7 kg).

Louisiana striped mullet 4 and 5 years old averaged between 350 and 390 mm FL (Thompson *et al.* 1989). Thompson *et al.* (1990) found a near-linear growth rate to age 3 and a later typical asymptotic pattern with fork lengths leveling off at approximately 350 mm (Thompson *et al.* 1990). Thompson *et al.* (1991) reported von Bertalanffy growth models as follows for Louisiana striped mullet:

$$L_t = 471.70 [1 - e^{-0.28(t-0.08)}]$$

$$\text{Female weight: } W_t = 643.57 [1 - e^{-0.88(t-1.16)}]^{2.93}$$

$$\text{Male length: } L_t = 366.98 [1 - e^{-0.36(t-0.15)}]$$

$$\text{Male weight: } W_t = 545.37 [1 - e^{-0.50(t-0.16)}]^{2.93}$$

They also noted that fish collected East of the Mississippi River showed different growth parameters from those taken West of the River, but noted that collection methods were different for the fish taken from different parts of the state, which could have influenced the parameter estimates.

Thompson *et al.* (1991) stated that over the entire range of striped mullet examined, length-weight, girth-weight, and otolith-body weight relationships did not differ significantly between males and females. However, analysis of striped mullet (mostly females) obtained from the U. S. Sabine National Wildlife Refuge showed that their growth and reproductive parameters differed from mullet obtained from the Louisiana Department of Wildlife and Fisheries. The fork length/total weight relationship reported by Thompson *et al.* (1991) was:

$$TW = 2.1 \times 10^{-5} (FL)^{2.93} (r^2 = 0.99).$$

Thompson *et al.* (1991) also provided conversions between total length, fork length, and standard length. These slopes of the conversion equations were reported to not differ by sex. The equations were as follows:

<u>Conversion</u>	<u>Equation</u>	<u>r²</u>
TL to FL	FL = 0.87 x TL + 4.37	.995
FL to TL	TL = 1.13 x FL - 3.40	.995
FL to SL	SL = 0.89 x FL - 4.54	.994
SL to FL	FL = 1.12 x SL + 6.65	.994
SL to TL	TL = 1.28 x SL + 2.80	.989
TL to SL	SL = 0.77 x TL + 0.30	.989

2.7 Other Life History Aspects

2.7.1 Food Habits

Mullet are primary consumers that feed mostly on relatively tiny living and dead vegetable matter (Collins 1985). According to De Silva (1980) most researchers now agree that larval mullet mainly eat microcrustaceans. Nash *et al.* (1974) grew larvae to 20 mm SL using animal matter as a food source and thus demonstrated the dependence of larvae and postlarvae on zooplankton. In Indian River Lagoon (Florida), stomach content analyses were performed on nearly 400 *Mugil cephalus* larvae up to 35 mm SL. Larvae up to 15 mm SL ate almost exclusively copepods (70%) and mosquito larvae (30%); those in the 15-25 mm SL range consumed copepods (50%), mosquito larvae (15%), and plant debris (35%); larvae 25-35 mm SL ingested mainly plant debris (80%) and copepods (10%) (Harrington and Harrington 1961). DeSilva and Wijeyaratne (1977) discovered that the proportion of sand and detritus in the gut of juveniles increases with length, indicating they tend to take more food from the bottom as they grow older. However, Odum (1968) found that mullet 35-80 mm in length fed on a bloom of the dinoflagellate *Kryptoperidinium* sp. and Futch (1976) stated that if non-toxic plankton blooms are available, mullet will feed almost entirely on plankton.

Mullet frequently feed by sucking up the uppermost layer of sediment, which is rich in detritus and microscopic algae, and by ingesting the epifauna and epiphytes on seagrasses and other substrates. They also eat surface scum when large amounts of microalgae can be found at the air-water interface (Odum 1970). Bishop and Miglarese (1978) reported that they also ingest polychaetes (*Nereis succinea*) in the water column. In some freshwater environments *Mugil cephalus* was found to eat mainly benthic filamentous green algae and epifauna and epiphytes on aquatic macrophytes (Collins 1981), but they also consume sediment for grinding.

The time of peak feeding activity varies with site. Odum (1970) found that in all the Florida habitats he studied, feeding varied with the height of the tide, whereas in the saltwater (Cedar Key, Florida) and freshwater (Crystal River, Florida) locations studied by Collins (1981) feeding was completely diurnal and had no relation to tidal stage. According to DeSilva and Wijeyaratne (1977),

Mugil cephalus showed diurnal periodicity in feeding activity. Peaks of activity were observed at dawn and around midday and these were not related to tidal stage. Brusle (1970) also stated that striped mullet feed during the day, Tabb and Manning (1961) reported the species often feed on flats at night and returns to channels in the daytime.

2.7.2 General Behavior

Broadhead and Mefford (1956) found that *Mugil cephalus* tagged and released just before spawning have as high a recovery rate as individuals released at other times of the year. This contradicts the belief held by some fishermen that mullet do not return after spawning and are therefore lost to the fishery.

Russell *et al.* (1987) observed that few species were caught as bycatch in gill nets and haul seines targeting striped mullet. They believed this to be due to the tight schooling behavior of the mullet.

Mahmoudi (1989) stated that mullet form large schools during spawning months in inshore waters and may move offshore in large numbers during these months. After returning from spawning offshore, schools disperse and move to tributaries during spring and summer months. Thompson *et al.* (1990) reported that as striped mullet move seaward through the estuaries toward open marine waters, there appear to be "staging" areas where the schools temporarily delay migration as schools coalesce into larger, massive concentrations. In southeast Louisiana, these coalescing schools can be found in Lake Borgne and Breton Sound (Thompson *et al.* 1990). Estuarine waters remaining warm late into the fall, and fall hurricanes may delay or disrupt these movements (Thompson *et al.* 1990). Thomson (1963) reported the timing of the offshore migration may vary as much as two months. Idyll and Sutton (1952) observed that migrations were not extensive in Florida, with 90% of their tagged mullet moving less than 32 km.

According to Hoese (1985) *Mugil cephalus* seems to have the same behavior as that described for *Rhinomugil corsula* by Hora (1938), as individuals of a school place much of the mouth, eye and the upper part of the opercle above the surface. This behavior, together with rolling and jumping, is thought to move air into the upper posterior portion of the pharynx where it is utilized for aerial respiration. The main evidence cited is that jumping frequencies are inversely correlated with dissolved oxygen concentrations, and that the pharyngobranchial organ has the ability to hold gas.

Hoese (1985) stated that escape jumps from predators or from fright are easily recognized because several disturbed fish jump together and they maintain an upright posture, entering the water cleanly. The normal jump is not as fast and not as long, and the mullet usually turns on its side or sometimes turns totally upside down before entering the water. Such easy jumps would not seem to be adequate in either dislodging parasites or fleeing, but would be one way to irrigate the pharyngeal chamber with air with a little expenditure of energy.

Juvenile *Mugil cephalus* 40-69 mm long can live in salinities ranging from 0-35 ppt. Mullet spend the remaining first year of their life in coastal waters, salt marshes and estuaries, and frequently swim to deeper water in the fall when the adults move offshore to spawn. However, many immature mullet overwinter in estuaries. Following their first year, striped mullet live in the ocean, saltmarshes, estuaries or freshwater rivers (Nordlie *et al.* 1982). It seems that on some occasions females are much more abundant than males in fresh and brackish water habitats (Shireman 1975, Collins 1981).

2.7.3 Pathology

Mullet are frequent hosts to parasitic infections and infestations. Collins (1958) found that in almost 300 adult mullet from saltwater and freshwater habitats on Florida's Gulf coast, all fish had parasites either on the body surface or gills.

Bacteria have attributed to individual *Mugil cephalus* mortalities. Lewis *et al.* (1970) documented deaths caused by a *Pasteurella*-like bacterium in Galveston Bay, Texas in November 1968. Substantial mucoid material covered the gill filaments and purulent material was found in abdominal cavities of sick fish. Plumb *et al.*, (1974) isolated a species of *Streptococcus* from mullet and other dying fishes from Florida to Alabama in August and September of 1972 and suggested that this bacterium was responsible. Cook and Lofton (1975) infected five species of fishes including *Mugil cephalus* with the bacterium and observed erratic swimming, external hemorrhagic lesions, peritoneal cavities, and intestines filled with a bloody fluid. Paperna and Overstreet (1981) stated Donald H. Lewis of Texas A&M University found many mullet from near Galveston, Texas, with *Vibrio anguillarum* during early spring. These fish developed petechial hemorrhages in and at the base of the fins, in the oral cavity and around the vent while being transported to the lab. Lewis also saw loss of scales and large lesions on the abdominal wall of mullet; *Pseudomonas* sp. was most often present in the lesions, liver and frequently the blood.

Bacteria in or on mullet can also cause disease in man by touching or eating the fish (Paperna and Overstreet 1981). Janssen (1970) pointed out the need for further research in public health. Some of the bacteria taken from fishes are *Aeromonas hydrophilia*, *Mycobacterium marinum*, *M. fortuitum*, *Vibrio parahaemolyticus*, *Erysipelothrix rhusiopathiae* and *Leptospira icterohaemorrhagiae*. All of the aforementioned can cause disease in man. Mullet can be vectors for cholera, salmonellosis, shigellosis, and probably other diseases besides those caused by the aforementioned bacteria. Most bacterial diseases that could be acquired from mullet can be prevented via cooking the fish (Paperna and Overstreet 1981).

Fungi which infect mullet, include the water-mould, *Saprolegnia* sp. (Sarig 1971). Mullet dying from this water-mould have been documented as well.

Flagellates also attack mullet. The parasitic dinoflagellate *Amyloodinium ocellatum* or a closely related species, sometimes infests striped mullet in Mississippi and can easily kill most pond fishes (Paperna and Overstreet 1981). *A. ocellatum* and related species become detrimental to

confined fish because of their reproductive capabilities. Fresh-water baths were effective against *A. ocellatum* whereas most tested chemicals (Lawler, in preparation) seldom were. In Mississippi, *Trypanosoma mugicola* occurs in the blood of striped mullet but appears to have no effect.

Ciliates can also be found in striped mullet. Skinner (1974) pointed out an unidentified trichodinid on *Mugil cephalus* from Florida closely resembling *Trichodina halli*. What seems to be two species of trichodinids in the gill area and on the integument live on striped mullet and white mullet (*M. curema*) from at least Louisiana to Florida. One or both species were observed in *Mugil cephalus* being raised in ponds at Rockefeller Refuge, Grand Chenier, Louisiana, (Overstreet, unpublished data). Frequently *Scyphidia* sp. (another peritrich) also lived on the integument and gills. The ciliate known as 'ich' (*Ichthyophthirius multifiliis*) is one of the most devastating parasitic diseases which attacks mullet and other fishes restricted to freshwater ponds or aquaria (Paperna and Overstreet 1981). Striped mullet fall prey to *Cryptocaryon irritans*, which is *I. multifiliis* salt water counterpart. Wilkie and Gordin (1969) found the fish vulnerable to this parasite when marine waters were warmer than 15° C.

Haemogregarina mugili is an Apicomplexa (taxonomic division which includes most taxa previously belonging to the Sporozoa) that infects only mullets. Saunders (1964) and Becker and Overstreet (1979) have observed it in striped mullet in Florida and Mississippi, respectively.

Mugil cephalus also hosts cysts of one or more species of *Kudoa* in Mississippi. These infections are found in the musculature and along the alimentary tract (Paperna and Overstreet 1981).

The parasite *Myxosoma cephalus* was found in *Mugil cephalus* from south Florida (Paperna and Overstreet 1981). It was discovered in the meninges, gill arches and filaments, buccal cavity, jawbone, crop, esophagus, intestine, liver and mesentery of the fish. This species was thought to have caused the heavy mortality of striped mullet in southern Florida in 1964 (Iversen, Chitty and Van Meter 1971). Material obtained from the brain-cavity and elsewhere pointed to this pathogen. More than one species of this complex can be found in mullet in America.

Parasitic copepods also infect striped mullet (Paperna and Overstreet 1981). The ergasilids *Ergasilus lizae*, *E. versicolor*, and two other forms parasitize *Mugil cephalus* in the United States (Johnson and Rogers 1973). Besides, several specimens of *E. funduli*, in areas heavy with cyprinodontid fishes frequently infest young or, sometimes, adult mullet. *E. longimanus* has been reported from Florida (Skinner 1974). Paperna and Overstreet (1981) stated that probably other ergasilid species parasitize mullet and pointed to ergasilids heavily infesting striped mullet in ponds at the Rockefeller Refuge near Grand Chenier, Louisiana. The fish however did not appear emaciated. The cyclopoid *Bomolochus concinnus*, plagues *Mugil cephalus* in the southeastern U. S. This parasite was observed in 20 of 83 fish with each fish having between 2-25 individuals in Biscayne Bay, Florida (Skinner 1974). *Bomolochus teres* and *B. exilipes* parasitized striped mullet in Texas (Pearse 1952, Causey 1953). *Naobranchia lizae*, a naobranchiid, has been found on the gills of striped mullet in the Gulf of Mexico (Paperna and Overstreet 1981). The lerneopodids *Clavellopsis robusta*, *Alella longimana* and *Clavella inversa* also plague *Mugil cephalus* from the Gulf of Mexico (Paperna and Overstreet 1981).

Argulus flavescens and *A. floridensis* (parasitic crustaceans that belong to the Branchiura) infest mullet throughout the Gulf Coast of the U. S. (Cressey 1972). A new species of *Argulus* was collected from *Mugil cephalus* in Mississippi (Overstreet 1974). There is definite evidence that species of *Argulus* have killed fishes in enclosed areas and therefore, they should be regarded as a threat to mullet in aquaculture (Paperna and Overstreet 1981).

Isopods also feed on striped mullet. The cymothoid *Merocila acuminata* (synonymous with a species closely related to *N. lanceolata*) parasitizes *Mugil cephalus* in Texas.

Monogeneans may be found on the gills and body of fishes. A new species of gyrodactylid plagues striped mullet in Florida (Skinner 1974). The dactylogyrid *Ancyrocephalus vanbenedenii* infests *Mugil cephalus* in the Gulf of Mexico.

Digenetic trematodes or flukes usually are the most abundant helminths in number of species and individuals (Paperna and Overstreet 1981). Table 2.1 from Paperna and Overstreet (1981), depicts adult digeneans observed in striped mullet in Louisiana and or neighboring states. Table 2.2 from the same source summarizes known zoogeographic information on digenean metacercariae. One major objection to *Mugil cephalus* as a food fish cited by Bardach *et al.* (1972) is that it carries a fluke *Heterophyes heterophyes* dangerous to man if the flesh is eaten raw or poorly cooked.

Phagicola longus causes few human infections in the southeastern U. S. because most fish is cooked, but eating raw, cold smoked, or salted mullet could easily modify the public health statistics (Paperna and Overstreet 1981). Courtney and Forrester (1974) found an average of 11,849 worms in each of 14 brown pelicans from Louisiana. Hamed and Elias (1970) observed live parasites in frozen fish at -10° or -20° C for 30 hours, but Paperna and Overstreet (1981) reported that deep freezing at -18° C for 24 hours killed all metacercariae. Hamed and Elias (1970) discovered live worms after 10 minutes at 100° C.

Cestodes are also commonly found in *Mugil cephalus*. At least two species under the group-name *Scolex polymorphus* have been found. One parasite was discovered in the cystic duct of striped mullet from Mississippi and Florida, the other was found in the intestine of young fish from Mississippi. A *Rhinebothrium* sp. has also been documented from the mesentery of *Mugil cephalus* in Mississippi (Paperna and Overstreet 1981).

Nematodes such as *Contracaecum robustum* larvae parasitizes *Mugil cephalus* from Louisiana, Mississippi, Alabama and Florida with heavy infections from near Grand Chenier, Louisiana, where the parasite may have affected the hosts' health (Paperna and Overstreet 1981). *Contracaecum robustum* lives in the liver, kidneys and adjacent tissues of striped mullet (Paperna and Overstreet 1981). *Hysterothlacium* type MB, recognized by Deardorff and Overstreet (1981) as a potential health hazard, has been found in *Mugil cephalus* in Gulf of Mexico waters. In addition, *H. reliquens* (Norris and Overstreet 1975) and *Hysterothlacium* type MD have been observed in Gulf of Mexico striped mullet (Deardorff and Overstreet 1981).

Larval ascaridoids are a potential human health hazard if infected fish are not well prepared. Symptoms comparable to those caused by cancer of the alimentary tract or an ulcer can be produced by some species (Paperna and Overstreet 1981).

Capillaria philippinensis was accused of human deaths in the Philippines. Most infected individuals had been consuming raw fish and shrimp (Paperna and Overstreet 1981). Rawson (1973) has documented small infections of *Capillaria* sp. from striped mullet in Georgia.

The acanthocephalan *Floridosentis elongatus*, may be found in the intestine of striped mullet from Florida to Texas. This species, in general, should not cause harm to *Mugil cephalus* in its natural environment (Paperna and Overstreet 1981).

The leech *Myzobdella lugubris*, can affect *Mugil cephalus* detrimentally if found in large numbers. It has been recorded from estuarine and fresh-water habitats in Mississippi (Sawyer, Lawler and Overstreet 1975). As discussed by Overstreet (1974), Sawyer *et al.* (1975) and others, leeches are probably vectors for the protozoan parasites living in the blood of mullet and other fishes.

Glochidia are the larval stages of the fresh-water bivalves of the Unionidae and striped mullet are potential hosts whenever they live in fresh-water (Paperna and Overstreet 1981).

Ciguatera poisoning can be acquired from eating *Mugil cephalus* either cooked or raw. Fortunately, Paperna and Overstreet (1981) stated that this type of poisoning is uncommon when you consider the quantity of mullet that is eaten throughout the world.

Hyuga fever which is synonymous with Kagami fever has *Richettsia sennetsu* as its aetiologic agent (Paperna and Overstreet 1981). Eating uncooked striped mullet may produce this disease in man (Kitao, Farrell and Fukuda 1973).

Paperna and Overstreet (1981) stated that in the United States only salt, glacial acetic acid and sulphamerazine can be used legally to treat mullet grown in aquaculture for consumption. For example, salt can be used to eliminate the disease caused by the phycomycete fungus *Saprolegnia* sp. on mullet. Paperna and Overstreet (1981) also declared that chemicals can harm mullet directly, they can harm people that consume or rear the fish and they can affect water quality. For example, malachite green may cause cancer, and if potassium permanganate is used in dust form, a cotton mask, safety glasses and gloves should be worn by the handler.

Overstreet (1990) declared that numerous health problems in aquaculture facilities, particularly those concerning marine stocks, can be eliminated, controlled or reduced by drying out ponds periodically. He added that getting rid of accumulated waste and employing lime or some other agent on the cleaned bottom will be appropriate in some cases while in others letting the sun bake the sediment for a few days might be enough.

Paperna and Overstreet (1981) stated that mullet have fed on sewage and on matter saturated with petroleum products. They presume pathogenic bacteria, toxic organic substances and heavy

metals acquired by the fish are accumulative and can all be transmitted to man when he eats the mullet.

Gilewicz *et al.* (1987) stated that many organisms have developed bio-chemical transformation pathways for the rapid elimination of many types of foreign compounds they are exposed to. They remarked that it is generally accepted that a cytochrome P₄₅₀ - dependent mixed function oxygenase is the initial enzymatic step in the detoxification pathway. Their study verified that *Mugil cephalus* does have cytochrome P₄₅₀ and that monooxygenase activity does occur in the liver microsomes of this fish.

2.7.4 Trophic Position in the Community

Adult striped mullet have been classified as detritivorous, herbivorous, and interface feeders. The diet and feeding behavior of the fish can vary by site, but their predominant food is either epiphytic and benthic microalgae, macrophyte detritus or inorganic sediment (Odum 1970). Collins (1985) stated that even though the diet of mullet overlaps that of a variety of aquatic species, inter-specific competition has not been reported. Cordona *et al.* (1996) stated the presence of striped mullet increases the global efficiency of resource exploitation, not only of detritus but also of small zooplankton.

Thomson (1963) observed that the main predators of juvenile and adult mullets are fishes and birds. Breuer (1957) reported that spotted seatrout (*Cynoscion nebulosus*) eat mullet up to 35 cm in length, and in Florida sharks occasionally feed heavily on large mullet. In Louisiana waters, juvenile and adult mullet have been found in stomachs of red drum (*Sciaenops ocellatus*) and spotted seatrout (LDWF data, H. Blanchet, pers. comm.).

2.7.5 Habitat Requirements by Various Life History Stages

Mullet live in many habitats and depths and spawn predominantly in relatively deep, cool coastal waters. Larval fish move inshore to shallow waters along beaches and enter salt marshes (Collins 1985). Thompson *et al.* (1990) reported postlarval and juvenile striped mullet showed a strong movement toward lower salinity estuarine waters and became common in estuarine habitats by mid to late winter. Seasonality data reported by Ditty and Shaw (1996) showed that most young *M. cephalus* leave offshore waters by April. Smaller juveniles in their first year in the estuaries showed strong preference for shallow protected shoreline and marsh habitats. With growth, the young-of-the year formed larger schools and became oriented more towards open water. Striped mullet of all size and age classes were found in Louisiana estuarine waters (Thompson *et al.* 1990). Major (1978) observed in Hawaii, in spite of near-lethal temperatures, schools of mullet less than 50 mm SL were invariably found in very shallow waters, including the swash zone and tide pools. Juveniles larger than 50 mm SL favor the slightly deeper waters beyond the swash zone, although, they may swim into shallow waters that smaller mullet have left unoccupied during flood tides. The very shallow water favored by fish smaller than 50 mm SL may help them elude the majority of their predators and to feed without significant competition. Perret *et al.* (1971) reported striped mullet

in Louisiana were more abundant in shallow waters near the shore. Seine collections produced fish during all months; the highest catches were made in January (Perret *et al.* 1971).

Larvae - Ditty and Shaw (1996) described the distribution of larval striped mullet in the offshore northern Gulf of Mexico. They found most larvae at stations with surface water temperatures $\leq 24.7^{\circ}\text{C}$ (range $16.7\text{--}27.0^{\circ}\text{C}$, mean 23.4°C) and salinities ≥ 34.0 ppt (range $23.5\text{--}36.8$, mean 34.4 ppt). Their largest tow came from 185 km (≈ 115 miles) south of the mouth of the Mermentau River in western Louisiana, in water 103 m (≈ 338 feet) deep. They caught striped mullet at stations with water depths between 7 and 2,837 m (23 to 9,308 ft.), with the highest relative frequency of stations containing larvae between 41 and 180 m (135 to 591 ft.).

Walsh *et al.* (1989) stated that development, defined in terms of age or mass, is the main factor that influences oxygen consumption by *Mugil cephalus* eggs and larvae. The absence of an effect by salinity and the moderate effect of temperature on oxygen consumption rates implies that striped mullet eggs and larvae are well adapted to variations in these two parameters. Walsh *et al.* (1989) also added that such adaptations are probably associated with the cosmopolitan distribution of this fish and contribute to its suitability for culture.

Temperature - An analysis of the worldwide distribution of striped mullet indicates mullet are temporary residents in regions where waters do not reach 18°C (Collins 1985). Young striped mullet living in salt marsh pools on Florida's Gulf coast at temperatures ranging from $13\text{--}34.5^{\circ}\text{C}$ were reported by Kilby (1949). Water temperatures presumably regulate the amount of time that young individuals stay in estuaries. For example, mullet less than 50 mm SL favor temperatures between $30.0\text{--}32.5^{\circ}\text{C}$ and fish from 50 to 130 mm SL prefer temperatures in the $19.5\text{--}20.0^{\circ}\text{C}$ range. For all sizes of mullet, the temperature chosen tends to decrease as salinity increases. The minimum water temperature reported for the species was 4.5°C (Moore 1976) and one adult was caught at 36°C (Moore 1974). Perret *et al.* (1971) stated that 1,146 striped mullet were taken by trawl and 1,280 were caught by seine in Louisiana. All fish were caught from water temperature intervals $5.0\text{--}9.9^{\circ}\text{C}$ up to and including water temperatures of $30.0\text{--}34.9^{\circ}\text{C}$.

Salinity - Live mullet of undetermined size were reported in waters with a salinity of 84-86 ppt, as were deaths and emigration above 75 ppt (Wallace 1975). Adult mullet have been documented from salinities ranging from 0 ppt (Collins 1981) to 75 ppt (Simmons 1957). Perret *et al.* (1971) reported striped mullet in Louisiana to range in size from 15 to 465 mm and to occur from fresh water to salinities over 30 ppt. The largest catches were made at 5.0 to 19.9 ppt. Sylvester *et al.* (1975) induced fish to spawn in the laboratory and found that egg survival was greatest at the highest salinity tested, 32 ppt. Survival of larvae was greatest at 26 ppt in tests from 24-36 ppt. Nordlie *et al.* (1982) stated that when mullet are 40-70 mm SL they achieve a definitive state of osmoregulatory capability and can live in fresh water to full strength sea water.

Dissolved Oxygen - Sylvester *et al.* (1975) observed that mullet eggs and larvae apparently cannot live below a dissolved oxygen (DO) level of 4 ppm. Over a range of 1.0-8.0 ppm DO, eggs incubated in the laboratory for two days had a survival rate of 0%-3% at levels 4.5 ppm and below. The survival rate was 85-90% for 5.0 ppm and above. Larvae were kept in DO concentrations of

4.0-7.9 ppm from 1-4 days. The larvae held for 96 hours had a mean survival of 0-8% at 4.0-5.4 ppm, 21% at 6.4 ppm, and 84% at 7.9 ppm. Even though 7.9 ppm was 146% saturation under the conditions tested, there was no sign of gas bubble disease. Collins (1985) reported no specific data on oxygen requirements for adult mullet from the literature. However, initial experiments with fish in cages reported by Collins (1985) revealed their tolerance to a DO level of 4.4 ppm at 29° C and a salinity of 28 ppt.

2.7.6. Environmental Tolerances

Diet deficiencies, environment, including pollution, and genetic problems can cause atypically shaped mullet (Paperna and Overstreet 1981). Tumors have been observed in striped mullet from the northern Gulf of Mexico and Biscayne Bay, Florida (Sindermann 1972, Lightner 1974, Edwards and Overstreet 1976). Increased pollution was suggested by Edwards and Overstreet (1976) as the cause of these tumors.

"Red tide" caused by dinoflagellates or dinoflagellates and bacteria have killed fishes along the Gulf of Mexico apparently by lowering the dissolved oxygen level when these organisms decompose. In addition, according to Ray and Wilson (1957), and Gates and Wilson (1960) single alga and bacteria-free cultures of *Gymnodinium breve*, and cultures of *Gonyaulax monilata* with bacteria, each produced one or more substances which were deadly to striped mullet in relatively low concentrations.

Paperna and Overstreet (1981) stated quick changes in water temperature, sometimes associated with salinity levels, probably are responsible for most naturally occurring fish kills. A massive kill almost completely of striped mullet was documented by Overstreet (1974) in tidally influenced bayous of the Mississippi after a period of freezing temperatures. Where salinity was greater than 6 ppt, other individuals of *Mugil cephalus* did not die.

Paperna and Overstreet (1981) reported that most major kills in estuaries are due to either oxygen-depletion or a combination of the aforementioned with some other factor. According to Christmas (1973) striped mullet and menhaden are the most impacted species in most kills of unknown cause in Mississippi.

Good water quality is not only essential for mullet and other fishes but also, for the people who eat them. Pesticides concentrate in mullet tissues, especially those containing lipids (Paperna and Overstreet 1981). The authors also reported humans can concentrate pesticides in their tissues by eating the mullet and that mullet can die from rapid release of high levels of pesticides stored in its fat into the blood during starvation.

TABLE 2.1. Adult digeneneans in *Mugil cephalus*, site and locality (from Paperna and Overstreet 1981)

PARASITE	SITE	LOCALITY
<i>Hysterolecitha elongata</i> Manter 1931	stomach, intestine	Mississippi
<i>Lecithaster helodes</i> Overstreet 1973	intestine, pyloric, caeca	Mississippi and Florida
<i>Epithelionematobothrium</i> sp. Skinner 1974	body cavity	Florida
<i>Haplospilachnus mugilis</i> Nahhas and Cable 1964	intestine	Florida
<i>Hymenocotta manteri</i> Overstreet 1969	intestine	Georgia to Louisiana
<i>Schikhobalotrema elongatum</i> Nahhas and Cable 1964	intestine, pyloric caeca	Florida
<i>Schikhobalotrema</i> sp. Skinner 1974	intestine	Florida
<i>Schikhobalotrema</i> sp. Nahhas and Short 1965	intestine	Florida
<i>Chalcinotrema mugilicola</i> (Shireman 1964) Overstreet 1971	intestine	Louisiana
<i>Dicrogaster fastigata</i> Thatcher and Sparks 1958	intestine, pyloric caeca	Georgia to Louisiana
<i>Saccocoelioides beauforti</i> (Hunter and Thomas 1961)	intestine, pyloric caeca	North Carolina to Louisiana
<i>Lasiotocus glebulentus</i> Overstreet 1971	intestine	Mississippi to Florida
<i>Lasiotocus mugilis</i> Overstreet 1969	intestine	Florida and Georgia

TABLE 2.2. Digenean metacercarie in *Mugil cephalus* (from Paperna and Overstreet 1981).

PARASITE	LOCALITY
Cyathocotylidae Poche 1926 <i>Mesostephanus appendiculatoides</i> (Price 1934) Lutz 1935	Florida
Bucephalidae Poche 1907 <i>Rhipidoctyle lepisostei</i> Hopkins 1954	Louisiana
Didymozoidae Poche 1907 <i>Didymozoid</i> larva	Mississippi
Acanthocolpidae Luhe 1909 <i>Stephanochasmus</i> sp.	Florida
Heterophyidae (Leiper 1909) Odhner 1914 <i>Phagicola longus</i> (Ransom 1920) Price 1932	Southeastern United States

Total Length of Striped Mullet from LDWF Seine Samples 1986–1995

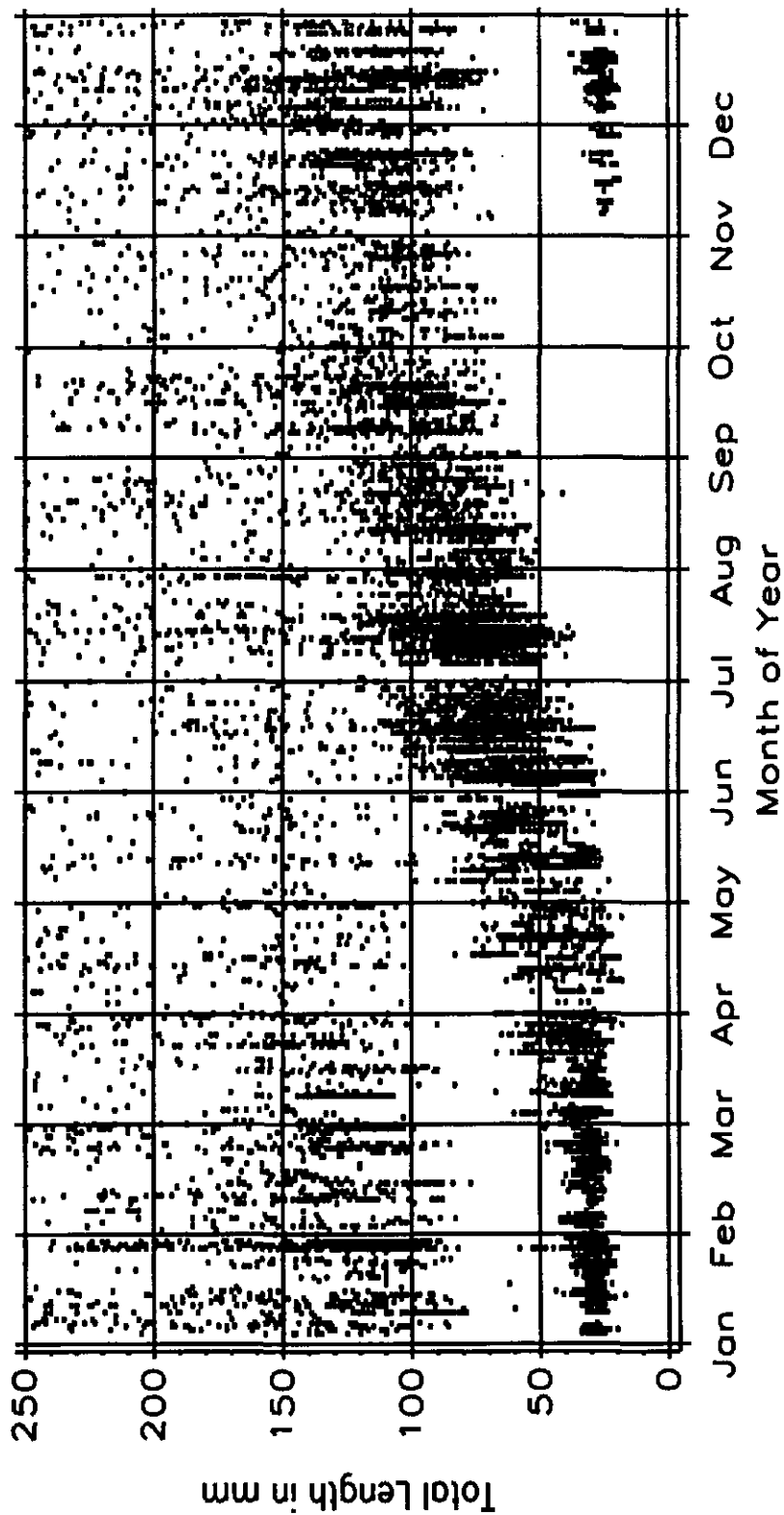


Figure 2.1. Total length of striped mullet taken in LDWF fishery-independent seine samples, 1986-1995. Fish over 250 mm TL excluded. Graph is intended to show the time of recruitment to the seine gear, and growth over the first year of life.

3.0 DESCRIPTION OF THE FISHERY

3.1 History of Exploitation

Due to the variety and abundance of more desirable species of fish in Louisiana waters, striped mullet were not a significantly targeted species until recently. Consequently, there is little documentation of the historic fishery. National Marine Fisheries Service (NMFS) records for striped mullet catch and landings in Louisiana are as early as 1930, although the commercial industry did not develop significantly until the 1970's. Commercial catches in those early years were probably limited to food or bait.

Recent creel surveys and historical information suggest that striped mullet are not a targeted recreational fish in Louisiana (Adkins *et al.* 1990, Guillory and Hutton 1990).

In all probability, the first mullet catches taken from Louisiana waters were taken by native Americans from tidal impoundments. Block off methods, primitive traps, baskets and nets were probably used to extract mullet from coastal estuaries in the past. European explorers and settlers may have expanded the removal of mullet from Louisiana waters during exploration and settlement by use of better boats, nets and fishing methods.

3.2 Commercial Fishery

The commercial striped mullet fishery in Louisiana consists of inshore and nearshore components. Boat size, type and size of fishing gear and fishery regulations are important in the divisional structure of the commercial fishermen and the area of fishing preference. The inshore fishery is composed mainly of smaller vessels, using hand-hauled gear. The nearshore fishery is composed of larger vessels, often with power reels for gear retrieval.

The striped mullet fishery is concentrated east of the Mississippi River with effort and catch per trip increasing during the spawning months in response to the availability of large fish aggregations and market demand for roe (Mahmoudi 1989).

From 1958 through 1990, Florida produced 80-90% of the United States mullet catch from the Gulf of Mexico (Collins 1985, Leard 1995). Louisiana's fishery has relatively recently expanded, mainly targeting roe mullet, and presently exceeds Florida's recent annual landings.

3.2.1 Description of Commercial Fishing Activities

The present commercial fishery is limited by statute to a season between the third Monday in October to the third Monday of the following January, using strike gill nets. Harvest is not allowed on weekends or at night. The present season structure essentially limits the harvest to the

"roe" season. The following description of fishing activities is intended as a historical characterization of the fishery as it has developed.

Louisiana fishermen have utilized a variety of methods to capture striped mullet for commercial exploitation: mono- and multifilament gill nets, seines, trammel nets and purse seines. Special interest was placed on some gear types as a result of experimental permits issued from 1980 through 1986.

Gill nets were usually deployed by one of two methods: **A.** As a set net located in an area of dense mullet concentrations or in a location that has a channeling effect; or, **B.** as a strike net deployed in a circling manner to surround the school. Recent legislation only allows strike netting. Schooling mullet were often located for strike net fishermen by spotter planes until this practice was outlawed in 1990.

"Florida skiffs" are the dominant type vessel used in the striped mullet gill net fishery. Skiffs from 22 to 28 feet in length are used which often have specialized gear such as a small flying bridge (for spotting), lights for night fishing (pre 1995 legislation) and power rollers for net retrieval (Russell *et al.* 1986).

The maximum legal length of saltwater gill nets used in the Louisiana mullet fishery is 1200 feet; they are constructed of 3.5 to 4.5 inch stretched multifilament mesh. The most common mesh size used is four-inch stretched, and the set time averages ten minutes (Russell *et al.* 1986).

Marais (1985) conducted a gill net study in an Eastern Cape estuary using multifilament polyester gill nets (0.5 mm thick). Each net consisted of five sections with stretched mesh openings of 55, 70, 85, 110 and 145 mm. Nets were set for 12 hour periods from dusk to dawn. Mullet catches indicated that 34% were caught around the head, 45% were caught around the widest part of the body, and 21% were gill-entangled.

Few incidental species are caught in gill net and haul seines used to harvest mullet due to the schooling behavior of mullet. Species which are occasionally caught in small numbers during mullet sets are sheepshead, black drum, red drum and Spanish mackerel (Russell *et al.* 1987).

In Louisiana, the gill net fishery for mullet initially operated in the area of Lake Borgne, Mississippi River Gulf Outlet, Breton Sound and Breton Bay (Bane *et al.* 1985). Since that time, landings data indicate the fishery has expanded to include some harvest westward of the Mississippi River.

Trammel nets are a gear consisting of at least three panels or walls grouped together in a sandwich-like fashion. The inner panel being smaller, the outer panels are large enough to allow the inner panel to be pushed through them, causing a pocketing effect that entangles individual fish (Everhart and Youngs 1981).

Fishermen using trammel nets in the mullet fishery probably changed to a method consuming less time to retrieve a net set, or remove the catch, or left the mullet fishery in favor of other fisheries.

Permits for seine use to harvest mullet were requested in 1980, the first year of the experimental fishery permitting system. Seines, most commonly used in conjunction with spotter planes (no longer permitted), are very efficient gear for catching large numbers of mullet, as they do not require the time consuming process of removing fish.

A study by researchers at LSU (Russell *et al.* 1987) showed that seines catch a higher percentage of males than gill nets, causing the price per pound from a seine set to be lower than the price per pound from a gill net set. They found the following sex ratios from samples taken East of the Mississippi River in Louisiana waters:

<u>Gill Nets</u>		<u>Haul Seine</u>	
Male	Female	Male	Female
15%	85%	53%	47%

Purse seines were a popular gear type utilized to harvest mullet prior to 1984, when this gear was prohibited by legislation. Purse seines have a purse line at the bottom of the net which is tightened in a draw string manner giving the net a bowl shape from which captured mullet can be scooped out with large dip nets (Everhart and Youngs 1981). Purse seines have the capability, depending on net size, of capturing over 100,000 pounds (45,000 kg) of mullet per set. Vessels which used purse seines were typically 50-80 feet (approx. 15-24 m) in length, with holding capacities of up to 200,000 pounds (9,000 kg) (Russell *et al.* 1986).

Prior to 1984, purse seine vessels operated primarily in Breton Sound and offshore waters due to permit restrictions banning them from most inshore waters. Most purse seine operators transported their catches directly to processors out of state, usually in Alabama or Florida (Bane *et al.* 1985). Regulatory changes have eliminated its use since 1986 (La. Administrative Code, Title 76, Part VII, Chapter 7).

3.2.2 Trends in Commercial Effort and Harvest

Recent increases in effort in the Louisiana striped mullet fisheries were initiated mainly by the demand of Florida and Alabama processors and the influx of out-of-state fishermen exploiting the mullet fishery. In 1976 a market developed in Florida for mullet roe (Mahmoudi 1989), greatly increasing the demand for mullet. The fishery expanded to Louisiana in light of the high quality of roe mullet extracted from Louisiana waters (Russell *et al.* 1987).

As in all fisheries, supply and demand are reflected by trends in harvest and prices. This scenario is greatly magnified during the spawning (roe) season and is quite obvious in monthly harvest records (Fig. 3.2). Since roe is the most valuable of the four marketed mullet products, the

greatest harvest of mullet takes place from October through January. The other mullet products are testes (white roe), stomachs (gizzards), and fillets (Bane *et al.* 1985).

The Hopedale-Yscloskey area in St. Bernard Parish has been the center for mullet roe production in Louisiana. In 1986, over 70 boats from Louisiana, Alabama, Florida and Mississippi, worked in St. Bernard Parish and the surrounding waters. Out-of-state fishermen were more experienced at netting mullet than most Louisiana fishermen, but more local fishermen developed an interest in the fishery due to its obvious profit potential at that time (Russell *et al.* 1987). Since the period from 1986 the fishery has expanded to include some harvest west of the Mississippi River. In 1995 legislation established several requirements for purchasing the necessary licenses and permits to commercially harvest mullet, reducing the numbers of harvesters in the mullet industry at present.

The history of the commercial striped mullet fishery in Louisiana can be divided into two periods of exploitation: pre-roo and roe market periods, the latter of which was initiated by Florida processors during 1976.

National Marine Fisheries Service (NMFS) records show Louisiana average landings of 87,729 pounds (39,478 kg) of mullet for the five year period 1972 through 1976. Average landings of 3,494,296 pounds (1,572,433 kg) of mullet for the twelve year period (1977-1994) followed the development of the mullet roe market (Fig. 3.1).

Prior to 1977, landings of striped mullet from Louisiana never exceeded a quarter of a million pounds with the exception of 1949 when 572,000 pounds (247,400 kg) were taken (Figs. 3.3 - 3.4, NMFS 1962-1994 Annual Louisiana Landings). For the period 1972 through 1976, landing records show a range of 15,845 (7,130 kg) to 213,000 pounds (95,850 kg) (Fig. 3.1). The twelve years following 1976 show an increase in striped mullet landings with only three years (1977, 1980 and 1985), falling below the one million pounds (Fig. 3.1). Records indicate that there was a significant harvest between June and October of 1980, 1981 and 1988 (Fig. 3.1). A late hurricane (Juan) followed by inclement weather during the spawning season of 1985 was responsible for the second lowest landing since 1976 i.e. 579,297 pounds (260,684 kg). Respective high (3,157,207 pounds (1,420,743 kg) in 1989) and low (204,310 pounds (91,940 kg) in 1980) landings of striped mullet occurred during the period 1977 through 1989. Record catches occurred each year during the 1990's through 1995, with landings data from 1995 being the highest recorded.

Increased demand for mullet roe and a corresponding price increase caused the Louisiana mullet fishery to evolve from an underutilized species fishery to the substantial fishery of today.

3.2.3 Aquaculture

Mullet does not seem to be a desirable species for aquaculture in Louisiana at this time due to its abundance in the wild, market competition with more desirable food fishes, and returns versus

costs in aqua farming. However, the holding of juveniles and subadults for harvest as roe mullet may be possible and economically feasible if legal and technical issues with this could be resolved.

Futch (1966) recommended the aquaculture of mullet because they are one of the major species reared in the Orient and because brackish ponds closely approximate the natural habitat. However, Futch points out two major economic factors to be considered in mullet aquaculture: the abundance of fish for stocking ponds and the high cost of pond development and maintenance.

Experiments with mullet aquaculture have been carried out in the following countries: Italy, Taiwan, Israel, India, Pakistan, Burma, Cyprus, Yugoslavia, Greece, Tunisia, United Arab Republic, Egypt, France, Indonesia, Philippines, Republic of China, Hong Kong, Japan, the United Kingdom and the United States.

Bardach *et al.* (1972) stated if researchers could succeed in unlocking the secrets of spawning and rearing *Mugil spp.* on a large scale, mullet could well become the most important human food product of the estuarine environment.

A brief summary of the major contributions to the propagation of mullet by artificial means as reported by Bardach *et al.* (1972) follows:

1. Artificial propagation of mullet was first achieved in Italy in 1930 by a method similar to "stripping" trout in hatcheries.
2. Induced ovulation and successful spawning of striped mullet by injecting ripening fish with striped mullet pituitary extract and the synthetic hormone Synahorin occurred in Taiwan in 1964.
3. In 1968, researchers in Israel spawned striped mullet using three time-lapsed injections of common carp pituitary.

Mullet are not normally regarded as a food fish in the United States, except for Hawaii, Florida, Georgia and, to some extent South Carolina, Alabama and Mississippi. Therefore, they have received a limited amount of research from United States aquaculturists. Bardach *et al.* (1972) summarized the following experiments regarding mullet aquaculture in the United States:

1. At Bears Bluff, South Carolina, a 0.6 hectare brackish water pond, 1 to 2 meters deep, stocked by natural processes and virtually unmanaged, yielded 85 to 227 kg/ha of fish, of which 47.5 to 74.2% were striped mullet, during five 6 to 13 month growing seasons.
2. Similar yields from fertilized ponds used for experimental monoculture were obtained at the Marineland Laboratory, Orlando, Florida.
3. A 5.6 hectare brackish water pond, 1.7 meters in depth, intended for pompano culture at the Florida Board of Conservation laboratory in St. Petersburg, Florida, produced a high yield of

extraneous fish. Striped mullet and white mullet constituted the majority of the fish population and yielded 767 kg/ha over a two year growing period.

In Louisiana, Perry (1972) and Perry and Avault (1975) conducted monoculture and polyculture studies with striped mullet from 1966-1973 at the Rockefeller Wildlife Refuge, Grand Chenier. In 1969, a monoculture pond was stocked with 2,519 mullet/ha to determine survival and growth during the winter. The mullet experienced water temperatures of 11° C with a survival rate of 87% and a production rate of 352.8 kg/ha. The pond was harvested after 317 days.

A polyculture pond of Atlantic croaker (*Micropogonias undulatus*) and striped mullet, into which supplemental feed was not added, was stocked the same year. Atlantic croaker survival was 10% and contributed 63 kg/ha. At the end of the study, mullet weighed 77 grams more on average in the polyculture pond than those cultured alone at the same density. However, survival of mullet was 18% greater in the monoculture pond.

In 1970, eight ponds were stocked with mullet at the following rates: 1) Two ponds at 247 fish/ha, 8 grams/fish; 2) three ponds at 4,940 fish/ha, 6 grams/fish, and 3) three ponds at 4,940 fish/ha, 33 grams/fish. Supplemental feed was not added. Mullet were harvested after 181 days with production of 1) 60 kg/ha, 2) 191 kg/ha and 3) 454 kg/ha respectively. Ponds stocked at 247 fish/ha were the only ones producing fish of harvestable size, averaging 380 grams (330mm). Approximately 65% of the fish harvested exceeded 340 grams.

During 1971, production of 1,602 kg/ha was obtained from a polyculture experiment with mullet and channel catfish (*Ictalurus punctatus*).

A polyculture experiment was conducted in 1972, stocking 4,940 channel catfish and 14,820 mullet per hectare. A monoculture control of 4,940 channel catfish supplementally fed was also conducted. Catfish in the polyculture pond produced 2,353 kg/ha and had a survival rate of 85%. Mullet survival was 51% and averaged 59 grams. Production of catfish in the monoculture pond was 2,323 kg/ha with a survival rate of 91%.

In 1973, experiments were conducted with Atlantic croaker and mullet in polyculture using a croaker monoculture as a control. The ponds were stocked with 4,940 croaker and 247 mullet/ha. Polyculture survival was 90% for mullet and 35% for croakers with mullet accounting for 136 kg/ha of the 315kg/ha of fish produced. Croaker survival and production from the monoculture pond was 35% and 123 kg/ha, respectively.

The Rockefeller experiments indicated mullet culture to be quite promising, though techniques must be improved and marketing, especially local, needs to be developed.

Mullet culture has not been developed in the western hemisphere other than the United States, although its potential for alleviating the serious protein problem of Latin America is obvious. It could also prove useful in reducing the protein supply problem in tropical Africa (Bardach *et al.* 1972).

3.2.4 Economics of the Commercial Striped Mullet Fishery

The commercial striped mullet fishery is divided into three markets, and the dockside price of each product may be different. Mullet are harvested for three general uses: as bait for fishing operations, as food fish for human consumption, and as a source of fish roe. Mullet sold for bait typically bring the lowest dockside price, while mullet sold for roe bring the highest.

Each market supplies a different geographic region. The bait market is essentially a local market, providing bait to crab and trotline fishermen in coastal Louisiana. Mullet as food fish is mainly marketed out of state, though a small local market exists in Louisiana. Most of these fish are exported to Georgia, Florida, and Alabama. Roe mullet is either processed within the state or shipped out of state for processing. The final product is intended for export to foreign countries, especially in Asia.

The effect of the roe market on prices may be seen in the dockside price paid on a monthly basis. Figure 3.7 shows the monthly harvest and dockside prices of mullet from 1978 to 1992. Those months of roe harvest (October to January) have higher prices than other months. Harvest is lower in October and January than in November and December. Prices will vary by month due to the quality of roe, availability from other areas, and availability of alternative species.

Figure 3.1 presents annual harvest and prices from 1978 to 1994 in Louisiana. This data for mullet harvest and associated price are unusual for commercial fisheries, where higher prices are typically associated with times of lower harvest. This may be due to the fact that Louisiana has been a small supplier and that Louisiana prices followed prices set in the Florida fishery. Further, the demand for roe increases demand and price for the fish during the roe season.

Only the female mullet has value for the production of roe, and the presence of significant numbers of males in the harvest can affect the price of this commodity. Males harvested in the roe fishery may be sold separately at a much lower price or may be included in the sale of females with the reduction of price absorbed by the entire catch. During the roe season, the harvest rate substantially exceeds the harvest rate at other times of the year. Therefore, there is relatively little directed harvest for food or bait at that time. However, the bait fishery has a ready supply of carcasses available from roe processors, and there is no need for quality control for mullet carcasses used as bait.

The price structure for mullet sold at the dock is variable and has become more complex over the past few years. Russell *et al.* (1986) described a simple price structure, with females receiving a higher flat rate dockside than males. More recently, common practices involve some method of variable pricing depending on the size (weight) of the individual roe, the percentage of roe by weight in the female, and the percent of females in the harvest (Table 3.1).

Prices per pound for mullet as food or bait are lower than the price for roe mullet (Figure 3.1). Since 1990, the market for mullet as a food fish has complicated the non-roe price structure.

Sales are unclear as to destination, and the prices collected monthly by NMFS may use an average price for bait and meat. However, prices adjusted for inflation showed an upward trend until 1996 and 1997. Preliminary information for 1998 indicates a continuation of that downward trend.

The price for male mullet in 1997 and 1998 has been steady at .10cents/lb. However, due to market demand and available sizes of roe, females have been purchased for .50 to 1.10/lb over the last two years. The roe sizes were lower than normal in these years, possibly due to increased use of relatively small mesh (3½" - 3⅝" stretched mesh) in the fishery. Gonadosomatic indices sampled from the fishery have shown that roe weights were down in 1997 and 1998. This in conjunction with market demand and competition could be the reason for red roe mullet prices in 1998 being \$0.50 to \$0.60/lb.

The Louisiana fishery is part of a larger regional fishery, which was dominated by Florida harvest until the 1990's, when the Louisiana landings became a more significant fraction of the total. Louisiana is also competing for the Asian roe market with other Gulf states and other countries, including Australia, South Africa, and Brazil, as well as with aquaculture product from Asia.

The typical relationship between price and harvest for most fisheries is not evident for Louisiana mullet. In most fisheries, landings for a species or group are inversely correlated with dockside price. For instance, if landings increase, prices tend to decline. When price is plotted against monthly landings, this produces a negative slope for the regression line. This is not the case for Louisiana mullet. Slope of the regression line between seasonal (roe or non-ro) harvest and price is not significant, and very near zero (Table 3.2), or is positive. This is perhaps not unexpected when the Louisiana fishery is considered as a relatively small part of the regional fishery. It does have implications, though, that at least at harvest levels seen in recent years, the market is fully capable of utilizing the harvest. It also implies that at least modest increases in landings would result in minimal declines in price per pound.

An economic analysis of a commercial fishery will involve dockside values. However, using only dockside prices will not measure the total benefit of the fishery to society. Commercial fishermen may accept lower financial returns and more uncertain benefits to remain within their occupation. There may be other non-monetary values the fisherman receives, such as more freedom, the aesthetic setting, wildlife seen while fishing, etc. Dockside value will not completely capture this value.

The total benefit to consumers of mullet is greater than a dockside price. Total benefits include the dockside price, any value added, and the willingness of some consumers to pay more than the market price. Value added is any processing or preparation of the fish for consumption as bait, food, or roe. Some consumers would be willing to pay more for mullet than the market price because they derive more satisfaction from its consumption. The total benefits to the Louisiana economy would include all these items.

3.3 Recreational Fishery

3.3.1 Description of Recreational Activities

Striped mullet are not a highly targeted species for sports fishermen because there is an abundance of more desirable sport fish in Louisiana's coastal waters and mullet are not a species which can be readily taken by hook due to their feeding habits. As documented by the 1984 Louisiana Department of Wildlife and Fisheries creel census (Adkins *et al.* 1990) only a limited number of mullet were taken, and then only incidentally. Striped mullet during the 1984 creel survey amounted to less than 1% of the total catch (Adkins *et al.* 1990).

Striped mullet are often caught by coastal inhabitants, usually by cast net, the preferred method of capture by recreational fishermen. These fish are taken to provide live, especially juveniles, or cut bait to fish for a variety of species in near shore and offshore waters; whereas larger fish may be consumed as fillets or smoked. Mullet are also taken to provide bait for recreational crab traps. Another method of capture is to throw a treble hook into a school of mullet in hopes of snagging a fish when the hook is retrieved. Many local youngsters historically fished for mullet from docks, piers, or roadside. They were successful in catching mullet by using a long-shanked small hook onto which was pressed a piece of bread, not unlike a dough-ball. Many hours of entertainment was provided by this "fishery".

3.3.2 Trends in Recreational Effort and Harvest

Data on striped mullet recreational effort and harvest at this time are not adequate to establish trends. However, it would seem logical that the majority of mullet taken recreationally as a target species are caught during the spawning season, October-February, when mullet are aggregated. Harvest of young-of-the-year "finger" mullet are probably distributed over the last half of the year, when mullet are available in sizes appropriate for use as bait. Saltwater recreational fishing effort is also higher at this time of the year than during January through April, so that harvest of larger mullet for bait may also increase with overall fishing effort.

3.3.3 Economics of the Recreational Striped Mullet Fishery

Recreational fishing is a highly diverse activity and has economic value. Participants are seeking a recreational experience and are willing to pay more for this activity than it actually costs. Households actually "produce" recreational trips by allocating their time, buying market services, and combining these with publicly provided natural resources (McConnell and Strand, 1994). The value of recreational fishing is variable across individuals and trips. It will depend on many conditions--the quality of fishing, the weather, the skill of the angler, etc.

There are two kinds of economic value for recreational fishing. One is the access value to a resource. Access pertains both to the overall opportunity for fishing and to the opportunity for

fishing in specific locations. The value of access is what anglers would pay rather than do without or the amount they would accept in compensation for their loss of access. The second kind of economic value is the value of catching an additional fish. This is the amount an angler is willing to pay to catch more fish, larger fish, or more desirable fish. This amount will depend on many things, such as the species sought, the time when fishing takes place, the mode of fishing, the weather, environment, etc.

The estimation of the value of a recreational fishery such as striped mullet will involve the measure of species specific effort and the expenses incurred. There have been several studies made to collect total numbers of recreational fishermen, percentage of fishermen targeting various species, average number of fishing trips per year, and expenditures per trip. Data from these studies have been highly variable among studies, even over the same time period. Conclusions drawn from these studies should therefore be viewed with caution.

Recreational fishing effort depends primarily upon the number of fishermen and number of trips per fisherman. Individual fishing effort is largely a function of the expenses incurred in the activity and the perceived benefits received from the activity. As costs rise and benefits remain the same, effort tends to decrease. Costs can increase through increased spending, in relation to other leisure activities, or as a fraction of disposable income. Anglers can receive both tangible and intangible benefits from fishing activities. Tangible benefits include the number or quality of fish caught. Intangible benefits can be enjoyment of the outdoors, change in routine, companionship, etc.

Fishing effort will continue as long as the economic costs are not greater than the angling satisfaction (or what economists call utility). Fishing net benefits (satisfaction minus costs) may decline due to satiation, declining catch per angler, congestion at favored locations, degradation of aesthetic value of trips, or from increased fishing costs.

Direct expenditures per trip for marine recreational anglers in Louisiana were estimated at \$53 (Kelso *et al.* 1992), \$64 (Bertrand 1984), \$75 (Kelso *et al.* 1991), and \$133 (Titre *et al.* 1988). Direct expenditures include spending for automotive and boat fuel, lodging, food and drinks, ice, boat launch fee, bait, and other expenses directly related to the trip. In addition to trip expenditures, anglers purchase equipment (boats, motors, trailers, vehicles) and speciality gear. This equipment is used for more than one trip and even over several years. Their cost needs to be allocated over time. Published annual estimates of these expenses vary widely depending on what is included: \$800 (U. S. Fish and Wildlife Service 1997), \$698 (U.S. Fish and Wildlife Service 1993), \$824 (Kelso *et al.* 1991), and \$1108 (Kelso *et al.* 1992).

Bertrand (1984) estimated total annual expenditures by saltwater anglers in Louisiana as 180.6 million dollars. Estimates can also be calculated from other surveys. From a 1985 survey, the U.S. Fish and Wildlife Service (1988) estimated that state residents spent a total of \$197 million dollars on saltwater fishing expenses, including equipment and trip-related expenses. Nonresident anglers spent an estimated \$37.6 million in trip-related expenses in Louisiana. From the next survey in 1991, the U.S. Fish and Wildlife Service (1993) estimated expenditures of 158.8 million dollars

by state residents on saltwater angling. As in the 1985 U.S. Fish and Wildlife survey, expenditures of nonresident anglers were not broken out by fresh and saltwater expenditures. However, from the 1991 survey data, the Sport fishing Institute estimated that expenditures of saltwater anglers in Louisiana total \$183.3 million (Fedler *et al.* 1993). The 1996 U.S. Fish and Wildlife survey reported total (fresh and saltwater) angler trip and equipment expenditures in Louisiana to be \$824.3 million, 9.2% from non-resident anglers. From the 1996 survey data, the American Sportfishing Association (Maharaj and Carpenter 1998) estimated that expenditures of saltwater anglers in Louisiana totaled \$205.4 million.

Direct expenditures for the fishing trip may be less than the angler would be willing to pay for the whole experience. The difference between the costs of the trip and what the angler is willing to pay is called consumer's surplus. This is the difference between the maximum amount an angler would be willing to pay and what he/she actually paid for the activity. Titre *et al.* (1988) found that the average recreational user would be willing to pay approximately \$193 to \$394 annually for the right to recreate in Louisiana wetlands under certain conditions of harvest, catch, and amenity situations.

Mullet are seldom targeted by Louisiana recreational anglers as a food or sport fish. Estimates of mullet harvest by anglers in the state are highly variable, and the size frequency of the harvest indicates that at least some of the harvest is intended as bait. Though there is little directed recreational fishery, striped mullet do have value to recreational fishermen as bait for a wide range of species which are targeted by these fishermen.

Mullet are a relatively hardy species, easy to maintain in a live condition on board a vessel, so are often used as live bait. Many recreational fishermen capture mullet, rather than purchasing them from retail tackle and bait shops. An estimate of the value of mullet to these fishermen can be estimated by the cost of alternative baits, such as live shrimp or Gulf killifish ("cocahoe minnow"). The price of bait in a live condition on the Louisiana coast presently is approximately \$2.00 per dozen.

Mullet are also sold as gutted or cut frozen fish for use as cut bait or whole bait for crab traps, or as chum for some types of angling. In this condition, sale price to the fishermen typically is in the \$2.00 to \$6.00 per dozen range. No data on statewide sales are available for this resource, but it probably is only a small fraction of the statewide total harvest. At least some of the mullet utilized in this market are imported from other states and do not come from the Louisiana fishery.

Data on retail bait mullet sales are not available. Estimates of numbers of mullet harvested by recreational fishermen are available from the Marine Recreational Fishery Statistics Survey (MRFSS), but disposition of these fish, whether they are used as bait or directly consumed, is not determined. Without these values, complete estimation of the value of the species to the recreational fisher is presently indeterminate.

Table 3.1. Example price matrix for Louisiana roe mullet, based on roe percentage of body weight and whole fish weight. In this case, the percentage of roe and count are based on sampling procedure below; count is the number of whole fish in a 100 pound sample. For instance, "50 ct." fish are 50 fish per 100 pound box, or two pounds each on the average. If "50 ct." fish yield 16% roe from the procedure below, the price would be \$1.30 per pound for the whole (round) fish.

Sample Roe Mullet Price Chart
(All fish yielding 2-4 ounce red roe)

Pct\count	50 ct	60 ct	70 ct	80 ct	90 ct	100 ct	>100 ct
12%	\$1.10	\$0.95	\$0.80	\$0.65	\$0.50	\$0.35	*
13%	\$1.15	\$1.00	\$0.85	\$0.70	\$0.55	\$0.40	*
14%	\$1.20	\$1.05	\$0.90	\$0.75	\$0.60	\$0.45	*
15%	\$1.25	\$1.10	\$0.95	\$0.80	\$0.65	\$0.50	*
16%	\$1.30	\$1.15	\$1.00	\$0.85	\$0.70	\$0.55	*
17%	\$1.35	\$1.20	\$1.05	\$0.90	\$0.75	\$0.60	*
18%	\$1.40	\$1.25	\$1.10	\$0.95	\$0.80	\$0.65	*
19%	\$1.45	\$1.30	\$1.15	\$1.00	\$0.85	\$0.70	*
20%	\$1.50	\$1.35	\$1.20	\$1.05	\$0.90	\$0.75	*

* No market price for fish this small

Sampling Procedure for Estimating Percent Roe:

- 1) From a 100 pound sample of fish, count and record the number of fish in the sample.
- 2) Remove all "red roe" and "white roe" from the fish. Sort the carcasses by sex.
- 3) Weigh male fish and gonads together.
- 4) Select female fish, as nearly as possible the same size and number as the removed males, from fish not included in the original sample.
- 5) Remove the roe from these fish, and add the roe and carcasses to the original female sample.
- 6) Weigh all of the female roe in the adjusted sample.

The resulting weight equals the percentage of "red roe" found in all of the female fish in the full lot being sold.

If purchased, male fish are typically purchased at a greatly reduced price, based on the percentages obtained in step 3 above. Otherwise, the price is adjusted by the percentage of males, with no value being given these fish.

Table 3.2. Relationships between price and landings for Louisiana mullet. Prices are deflated to 1994 dollars. Landings by gear and season (roe and non-roe), and monthly total landings are regressed against dockside price. Estimation function is:

$$\text{Price (in 1994 dollars)} = \text{Intercept} + \text{Slope} * \text{Landings.}$$

Landings Type	Intercept (\$/lb)	Intercept St. Err. (\$/lb)	Slope (\$/lb*10 ⁶)	Adjusted r ²
Regression for 1986-94				
Total landings	0.2969	0.017	+0.112**	0.13
Regression for 1986-89				
Gill Net	0.2361	0.031	+0.561**	0.55
Haul/Purse seine	0.2005	0.064	+0.508 (n.s.)	0.04
Trammel	0.2644	0.128	+41.767 (n.s.)	0.15
Trawl	0.3049	0.041	+9.105 (n.s.)	0.00
Roe Season	0.5578	0.050	+0.243*	0.16
Non-roe	0.1781	0.011	-0.284 (n.s.)	0.02
Regression for 1990-94				
Roe Season	0.6661	0.074	+0.034 (n.s.)	0.02
Non-roe	0.3439	0.028	-0.156 (n.s.)	0.02

*slope significant at p=0.05 level

**slope significant at p=0.01 level

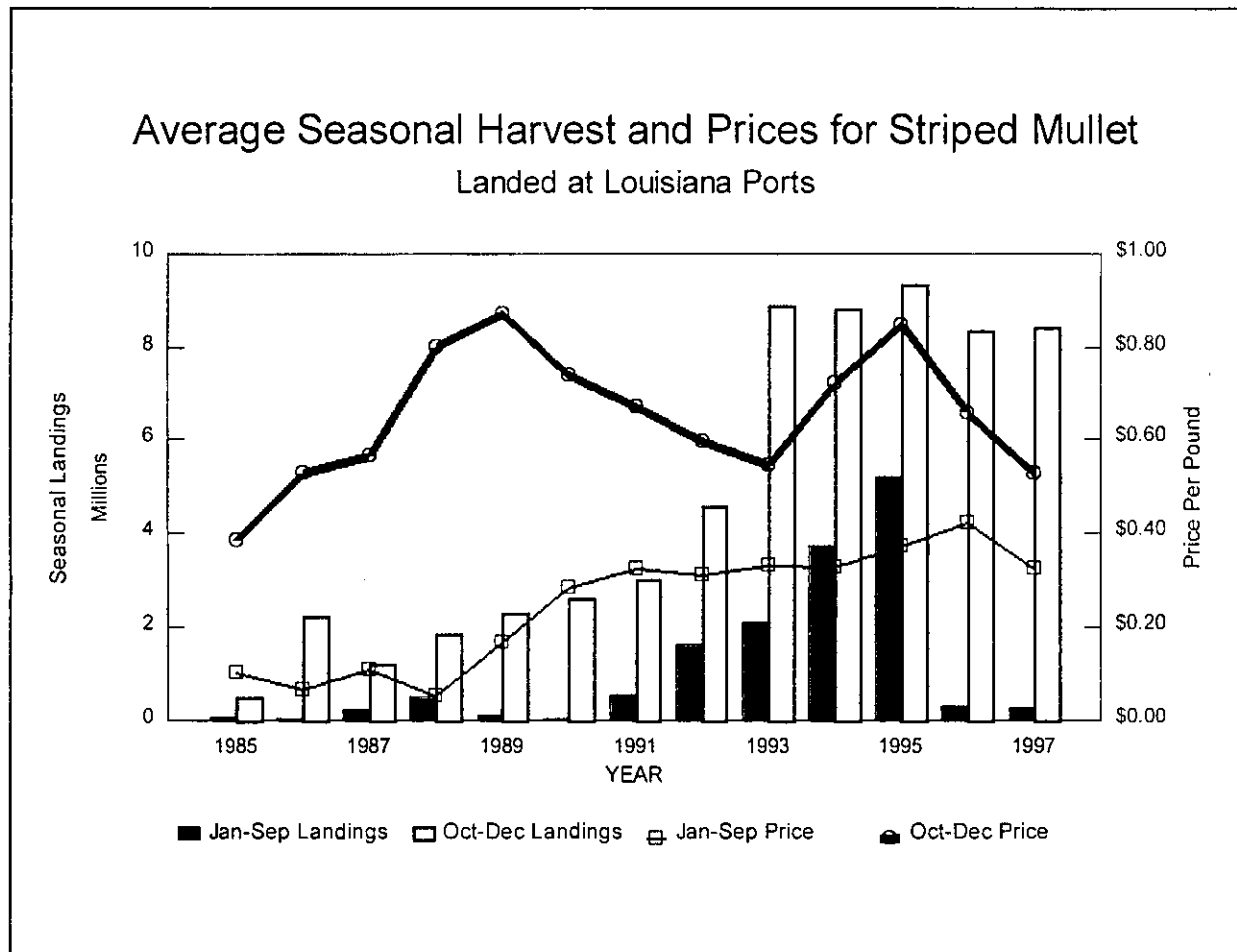


Figure 3.1. Seasonal harvest and prices for striped mullet landed in Louisiana. "Roe" season landings are from October through December, "non-ro" includes January through September.

Landings of Striped Mullet by Month, 1978-92

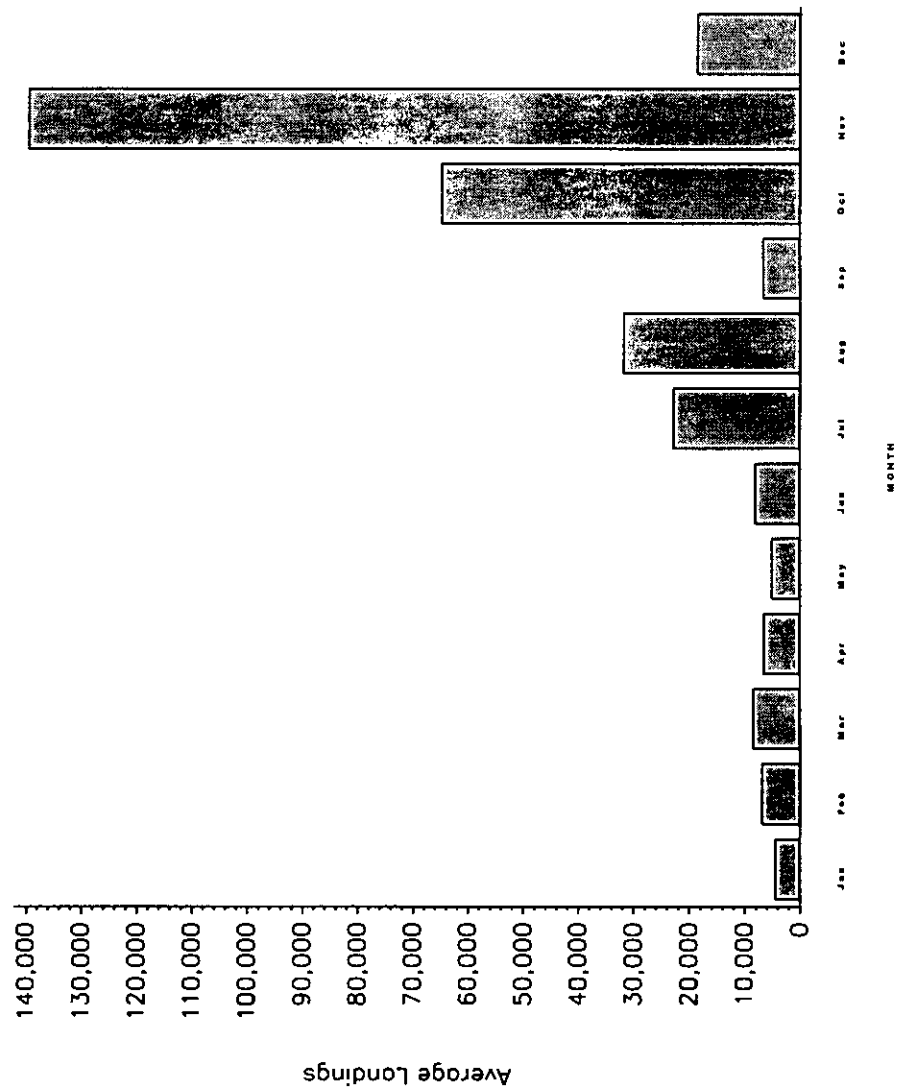


Figure 3.2 Relative monthly landings of striped mullet in Louisiana, based on 1978-1992 monthly landings.

ANNUAL LOUISIANA LANDINGS STRIPED MULLET 1930-1950

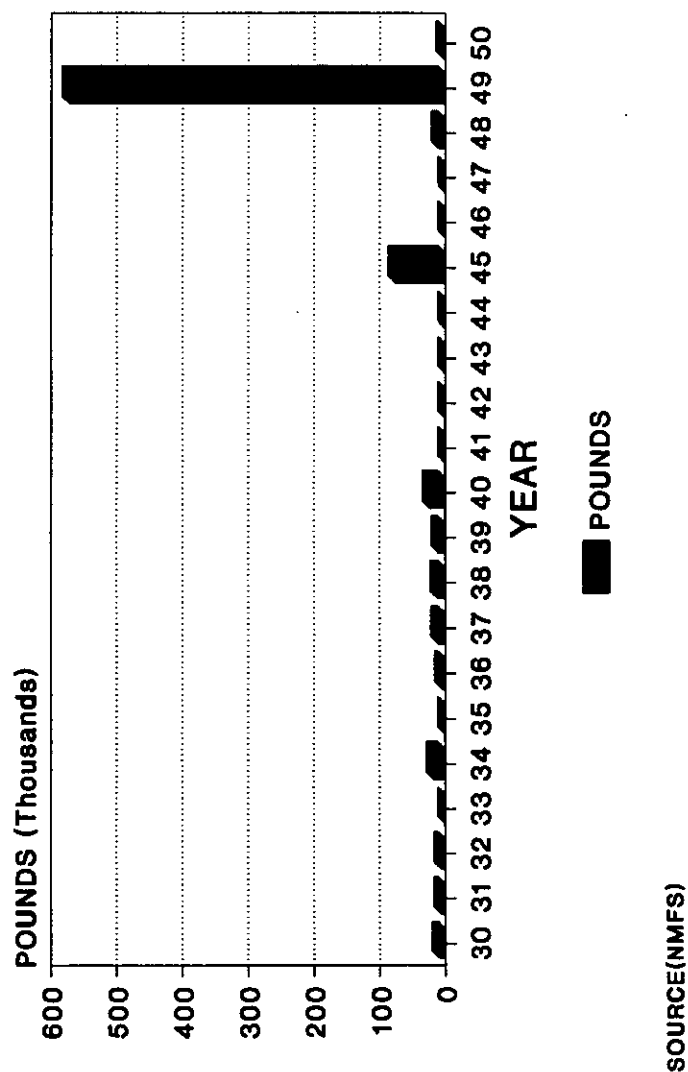


Figure 3.3. Annual landings of striped mullet in Louisiana, 1930-1950. Source: NMFS annual landings statistics summary.

ANNUAL LOUISIANA LANDINGS STRIPED MULLET 1951-1970

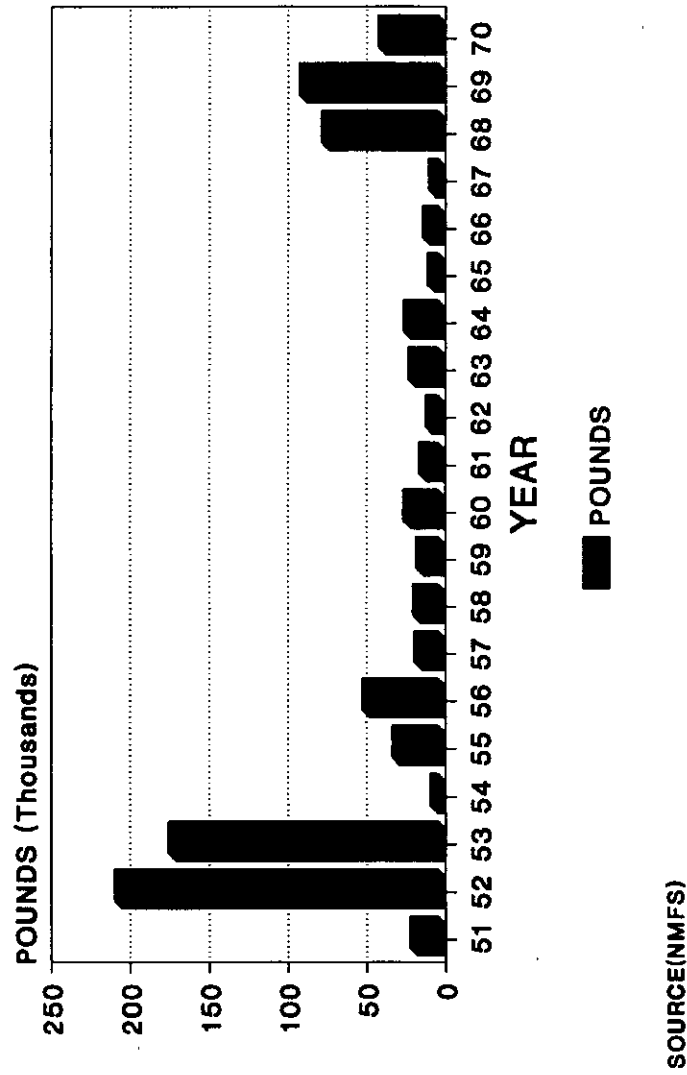


Figure 3.4. Annual landings of striped mullet in Louisiana, 1951-1970. Source: NMFS annual landings statistics summary.

ANNUAL LOUISIANA LANDINGS STRIPE MULLET 1971-1990

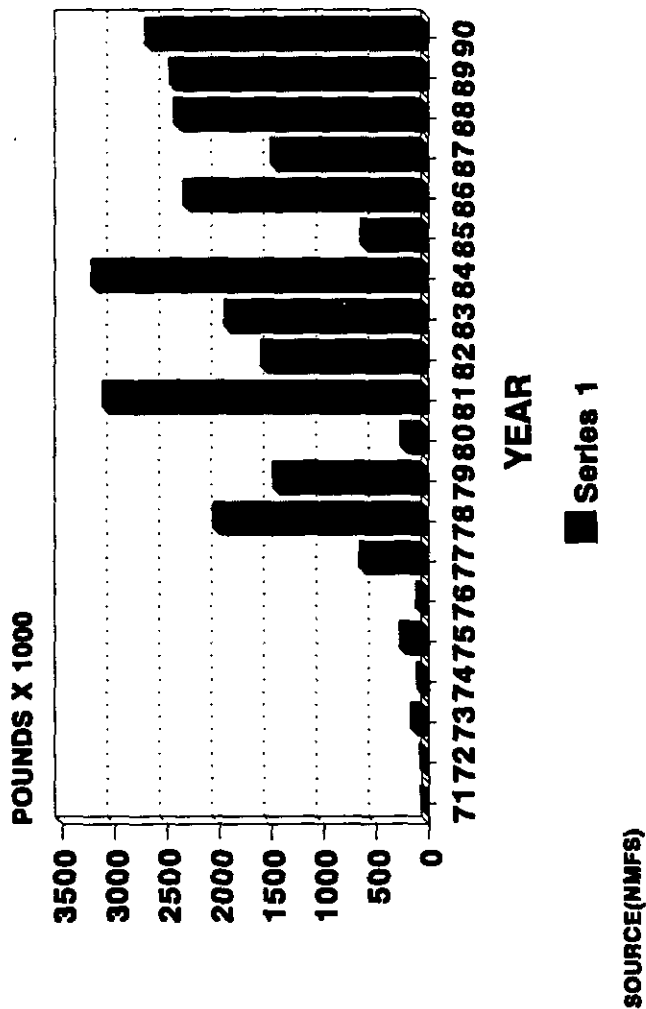


Figure 3.5. Annual landings of striped mullet in Louisiana, 1971-1990. Source: NMFS annual landings statistics summary.

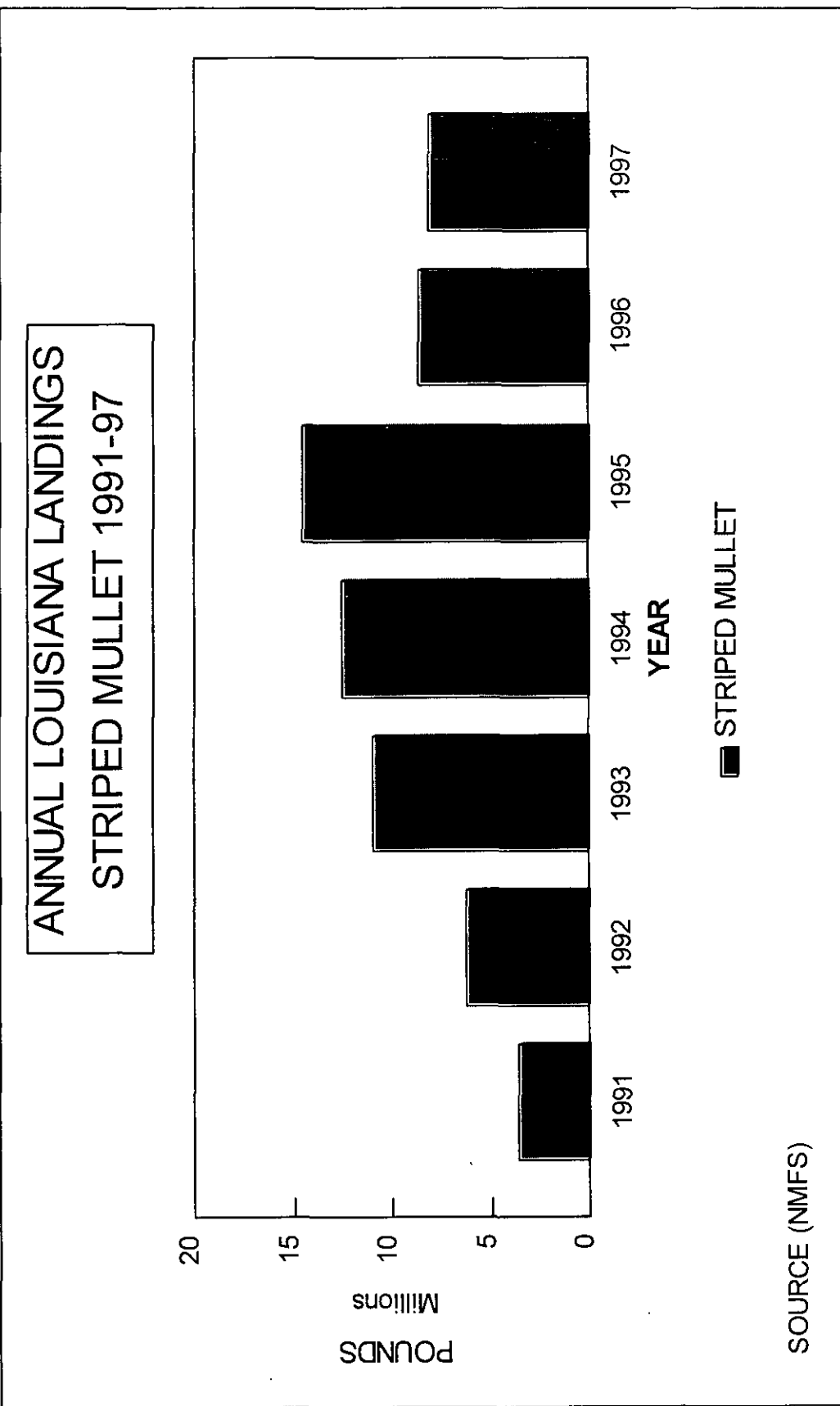


Figure 3.6. Annual landings of striped mullet from Louisiana water, 1991-97. Source: NMFS annual landings statistics summary

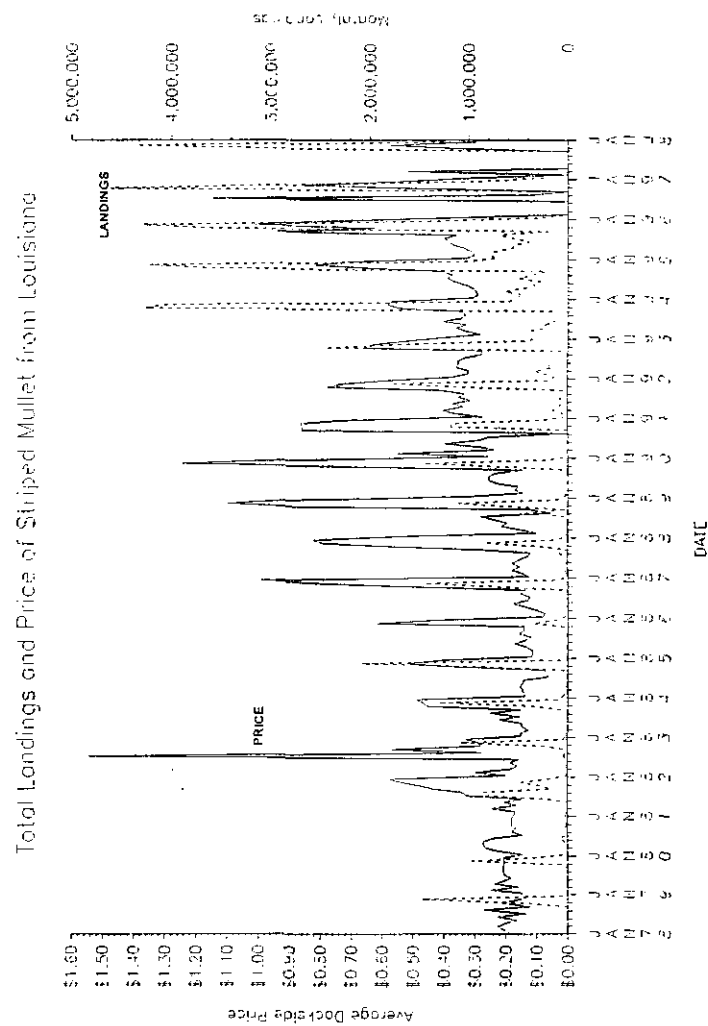


Figure 3.7. Landings (dashed line) and average monthly price per pound (solid line). Prices adjusted to value in 1994 dollars using CPI index.

4.0 RESEARCH NEEDS

4.1 Fishery-independent Data

There is some information to suggest that growth rates and sizes of mullet available to the fishery differ in various parts of the State. Identification of these variations could allow establishment of local regulations which could increase yield in the fishery and help distribute output from the fishery geographically. In other areas of the Gulf Coast, harvest of mullet outside of the roe season has utilized significantly smaller mesh nets. Since the species is abundant throughout the Gulf, if significant movement of juvenile and adult mullet is present, these fisheries could affect the availability of striped mullet to Louisiana fishermen.

Estimation of migration rates of juveniles and adults through tagging or other means would assist in estimating the independence of yield between fisheries with differing regulations. Theoretical or field studies analyzing larval drift could help to delineate regional recruitment effects for the species.

4.2 Fishery-dependent Data

4.2.1 Biological

The existing Louisiana fishery is predominantly a fishery for roe mullet during the fall of the year. This fishery predominantly uses a gill net of 3¾ - 4 inch mesh. The mullet at this time of year has a larger girth than at other times of the year. There is an increasing fishery using 3½ to 3¾ inch mesh gill nets outside the roe season. The ages harvested by this fishery are not known at this time. Evaluation of the age distribution of this fishery will be necessary before the impact of this fishery on the roe season fishery could be quantified. A consistent fishery-dependent monitoring program collecting information on gears, ages, and sexes harvested would allow much more quantitative information on allowable harvest.

4.2.2. Social and Economic

Social and economic information is needed on participants of the mullet fishery. Information on other fisheries that these mullet fishers participate in, processing and marketing costs, investment, operating, and harvesting costs, could help identify the health of the industry and impacts of regulatory changes on participants in the mullet fisheries.

5.0 BIBLIOGRAPHY

- Abraham, M., N. Blanc and A. Uashouv. 1966. Oogenesis in five species of grey mullets (Teleostei, Mugilidae) from natural and landlocked habitats. Israel J. Zool. 15:155-172.
- Adkins, G., V. Guillory and M. Bourgeois. 1990. A creel survey of Louisiana recreational saltwater anglers. La. Dept. of Wildl. and Fish., Tech. Rept. 41, Seafood Division. pp 5-57.
- Anderson, W.W. 1958. Larval development, growth, and spawning of striped mullet (*Mugil cephalus*) along the south Atlantic coast of the United States. U.S. Fish & Wildl. Serv. Fish. Bull. 58: 501-519.
- Arnold, E.L. and J.R. Thompson. 1958. Offshore spawning of the striped mullet (*Mugil cephalus*) in the Gulf of Mexico. Copeia 1958:130-132.
- Bane, G.W., S.J. Russell, J.H. Render, C. Boulet, S. Ellsworth and S. Locy. 1985. Commercial mackerel, snapper, grouper, black drum, mullet, and inshore shrimp fisheries research program in Louisiana Annual Report. Publication No. LSU-CFI-85-10, Center for Wetlands Resources, La. St. Univ., Baton Rouge. pp 57-85.
- Bardach, J.E., J.H. Ryther and W.O. McLarney. 1972. Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms. Wiley-Interscience. New York. 868 pp.
- Bertrand, A.L. 1984. Marine recreational finfishermen in Louisiana: Socioeconomic study of licensed recreational finfishermen fishing in Coastal Study Area IV. LA. St. Univ. Coastal Ecology and Fisheries Inst., Tech. Series 3.
- Bishop, J.M. and J.V. Miglarese. 1978. Carnivorous feeding in adult striped mullet. Copeia 1978:705-707.
- Breder, C.M. Jr. 1940. The spawning of *Mugil cephalus* on the Florida west coast. Copeia 1940(2): 138-139.
- Breuer, J.P. 1957. Ecological survey of Baffin and Alazan Bays, Texas. Publ. Inst. Mar. Sci. Univ. Tex. 4(2):134-191.
- Broadhead, G.C. 1953. Investigations of the black mullet, *Mugil cephalus* L., in northwest Florida. Florida Board of Conservation Technical Series No. 7. pp 33.
- Broadhead, G.C.. 1958. Growth of the black mullet (*Mugil cephalus* L.) in west and northwest Florida. Florida Board of Conservation Technical Series No. 25. pp 29.

- Broadhead, G.C. and H.P. Mefford. 1956. The migration and exploitation of the black mullet, *Mugil cephalus* L., in Florida as determined from tagging during 1949-1953. Florida Board Conservation Technical Series No. 18. pp 31.
- Brusle, J. 1970. Food and feeding in grey mullet. In O.H. Oren (ed.) Aquaculture of grey mullets, University of California Press, Berkeley. pp. 185-217.
- Campton, D.E. and B. Mahmoudi. 1991. Allozyme variation and population structure of striped mullet (*Mugil cephalus*) in Florida. *Copeia* 1991:485-492.
- Causey, D. 1953. Parasitic Copepoda of Texas coastal fishes. Publ. Inst. Mar. Sci. Univ. Tex. 3, 7-16.
- Cech J.J. and D.E. Wohlschlag. 1975. Summer growth depression in the striped mullet, *Mugil cephalus* L. *Contrib. Mar. Sci.* 19:91-100.
- Christmas, J.Y. 1973. Co-operative Gulf of Mexico Estuarine Inventory and Study, Mississippi. Phase I. Area Description. pp.1-71, Gulf Coast Research Laboratory, Ocean Springs, Mississippi.
- Collins, M.R. 1981. The feeding periodicity of striped mullet, *Mugil cephalus* L., in two Florida habitats. *Journal of Fish Biology* 19:307-315.
- Collins, M.R. 1985. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (south Florida)-striped mullet. U.S. Fish Wildl. Serv. Biol. Rep. 82(11.34). U.S. Army Corps of Engineers, TR EL-82-4. pp 11.
- Cook, D.W. and Lofton, S.R. 1975. Pathogenicity studies with *Streptococcus* sp. isolated from fishes in an Alabama-Florida fishkill. *Trans. Am. Fish. Soc.* 104 (2), 286-8.
- Courtney, C.H. and Forrester, D.J. 1974. Helminth parasites of the brown pelican in Florida and Louisiana. *Proc. Helminthol. Soc. Wash.* 41 (1), 89-93.
- Cressey, R.F. 1972. The genus *Argulus* (Crustacea:Branchiura) of the United States. Water Pollution Control Research Series, Biota of Freshwater Ecosystems Identification Manual no. 2.
- Crosetti, D., W.S. Nelson and J.C. Avise. 1994. Pronounced genetic structure of mitochondrial DNA among populations of the circumglobally distributed grey mullet (*Mugil cephalus*). *J. Fish Biol.* 44:47-58.
- Deardoff, T.L. and R.M. Overstreet. 1981. Larval *Hysterothylacium* (Thynnascaris) (Nematoda:Anisakidae) from Fishes and Invertebrates in the Gulf of Mexico. *Proc. Helminthol. Soc. Wash.* 48 (2) pp. 113-126.

- De Sylva, D.P., H.B. Stearns and D.C. Tabb. 1956. Populations of the black mullet (*Mugil cephalus* L.) in Florida. Fl. St. Bd. of Cons. Tech. Ser. 19:7-45.
- De Silva, S.S. 1980. Biology of juvenile grey mullet: a short review. *Aquaculture* 19:21-36.
- De Silva, S.S. and M.J.S. Wijeyaratne. 1977. Studies on the biology of young grey mullet, *Mugil cephalus* L. II. Food and feeding. *Aquaculture* 12:157-167.
- Dindo, J., R. MacGregor and G. Crozier. 1978. Analysis of reproductive hormones and plasma lipid levels associated with the migration of the striped mullet, *Mugil cephalus* L. Mississippi-Alabama Sea Grant Consortium. MASGP-79-007.
- Ditty, J. and R.F. Shaw. 1996. Spatial and temporal distribution of larval striped mullet (*Mugil cephalus*) and white mullet (*Mugil curema*, Family: Mugilidae) in the northern Gulf of Mexico, with notes on mountain mullet (*Agonostomus monticola*). *Bull. Mar. Sci.* 59(2):271-288.
- Ebeling, A.W. 1957. The dentition of eastern Pacific mullets, with special reference to adaptation and taxonomy. *Copeia* 1957 (3) :173-185.
- Ebeling, A.W. 1961. *Mugil galapagensis*, a new mullet from the Galapagos Islands, with notes on related species and a key to the Mugilidae of the eastern Pacific. *Copeia* 1961:295-305.
- Edwards, R.H. and R.M. Overstreet. 1976. Mesenchymal tumors of some estuarine fishes of the northern Gulf of Mexico. I. Subcutaneous tumors, probably fibrosarcomas, in the striped mullet *Mugil cephalus*. *Bull. Mar. Sci.* 26 (1), 33-40.
- Everhart, W.H. and W.D. Youngs. 1981. Principles of Fishery Science, Second Ed. Cornell Univ. Press, Ithaca N.Y. 349pp.
- Evermann, B.W. 1899. Report on investigations by the United States Fish Commission in Mississippi, Louisiana, and Texas, in 1897. Rept. U.S.Comm. Fish & Fisheries for 1898.
- Fahay, M.P. 1983. Guide to the early stages of marine fishes occurring in the western North Atlantic Ocean, Cape Hatteras to the southern Scotian shelf. *J. NW Atlantic Fish. Sci.* 4:1-418.
- Fedler, Anthony J. and David M. Nickum. The 1991 Economic Impact of Sport Fishing in Louisiana, Sport Fishing Institute, Washington, D.C., U.S. Fish and Wildlife Cooperative Grant Agreement No. 14-48-0009-93-1248.
- Fischer, W. (Ed.) 1978. FAO species identification sheets for fishery purposes. Western Central Atlantic (Fishing Area 31). Vols. 1-7. Rome, FAO. pag. var.

- Futch, C.R. 1966. Lisa--the Florida black mullet. Fl. Bd. of Cons. Mar. Lab. Salt Water Fisheries Leaflet 6. 6 pp.
- Futch, C.R. 1976. Biology of striped mullet. In: J.C. Cato and W.E. McCullough (eds.) Economics, Biology and Food Technology of Mullet. State University System of Florida Sea Grant Prog. Rept. 15: 63-69.
- Gates, J.A. and W.B. Wilson. 1960. The toxicity of *Gonyaulax monilata* Howell to *Mugil cephalus*. Limnol. Oceanogr. 5(2): 171-174.
- Gilewicz, M., Guillaume, J.R., and Bertrand, J.C. 1987. Characterization of the liver cytochrome P₄₅₀ in the marine fish *Mugil cephalus* and the effects of some hydrocarbons on the mixed-function oxidase components. Mar. Biol. 96:157-162
- Gopalakrishnan, V. 1971. Taxonomy and biology of tropical finfish for coastal aquaculture in the Indo-Pacific region pp 120-149 In: T.V.R. Pillay (ed.), Coastal Aquaculture in the Indo-Pacific Region. Fishing News (Books) Ltd., London. 497 pp.
- Gowanloch, J.N. 1933. Fishes and Fishing in Louisiana. La. Dept of Conservation Bull. 23. (Reprint 1965 with addenda by Claude "Grits" Gresham, Claitor's Book Store, Baton Rouge, LA.) 628 pp.
- Grant, C.J. and A.V. Spain. 1975. Reproduction, growth and size allometry of *Mugil cephalus* L. (Pisces:Mugilidae) from North Queensland inshore waters. Austr. J. Zoology 23:181-201.
- Greely, M.S., D.R. Calder and R.A. Wallace. 1987. Oocyte growth and development in the striped mullet, *Mugil cephalus*, during seasonal ovarian recrudescence: relationship to fecundity and size at maturity. Fish. Bull. 85(2):187-200.
- Greenwood, P.H., D.E. Rosen, S.H. Weitszman and G.S. Myers. 1966. Phyletic studies of teleostean fishes, with a provisional classification of living forms. Bull. Am. Mus. Nat. Hist. 131(4):339-456.
- Gunter, G. 1945. Studies on marine fishes of Texas. Publ. Inst. Mar. Sci., Univ. Tex. 1:1-190.
- Hamed, M.G.E. and A.N. Elias. 1970. Effect of food-processing methods upon survival of the trematode *Heterophyes* sp. in flesh of mullet caught from brackish Egyptian waters. J. Food Sci. 35(4):386-388.
- Harrington, R.W. and E.S. Harrington. 1961. Food selection among fishes invading a high subtropical salt marsh: from onset of flooding through the progress of a mosquito brood. Ecology 42: 646-666.

- Hoese, H.D. 1965. Spawning of marine fishes in the Port Aransas, Texas, area as determined by the distribution of young and larvae. Ph.D. dissertation, Univ. Texas, Austin. 144 pp.
- Hoese, H.D. 1985. Jumping mullet-the internal diving bell hypothesis. *Environmental Biology of Fishes* 13(4):309-314.
- Hoese, H.D. and R.H. Moore. 1977. Fishes of the Gulf of Mexico, Texas, Louisiana, and Adjacent Waters. Texas A & M University Press, College Station, TX. 325 pp.
- Hora, S.L. 1938. Notes on the biology of the freshwater grey mullet, *Mugil corsula*, Hamilton, with observations on the probable mode of origin of aerial vision in fishes. *J. Bombay Natural History Society* 40:61-68.
- Hunter, J.R. and S.R. Goldberg. 1980. Spawning incidence and batch fecundity in northern anchovy, *Engraulis mordax*. *Fish. Bull.* 77(3):641-652.
- Hunter, J.R., N. Lo and R. Leong. 1985. Batch fecundity in multiple spawning fishes. *In*: R. Lasker (ed.). An egg production method for estimating spawning biomass of pelagic fish: Application to the northern anchovy *Engraulis mordax*. NOAA Tech. Rept. NMFS 36: 67-77.
- Hunter, J.R. and B.J. Macewicz. 1985. Measurement of spawning frequency in multiple spawning fishes. *In*: R. Lasker (ed.). An egg production method for estimating spawning biomass of pelagic fish: Application to the northern anchovy *Engraulis mordax*. NOAA Tech. Rept. NMFS 36:79-94.
- Idyll, C.P. and J.W. Sutton. 1952. Results of the first year's tagging of mullet, *Mugil cephalus* L., on the west coast of Florida. *Trans. Am. Fish. Soc.* 81:69-77.
- Iversen, E.S., N. Chitty and N. VanMeter. 1971. Some myxosporidia from marine fishes in south Florida. *J. Protozool.* 18(1): 82-86.
- Janssen, W.A. 1970. Fish as potential vectors of human bacterial diseases. *In*: A Symposium on diseases of fishes and shellfishes. Ed. S. F. Snieszko. Am. Fish. Soc. Spec. Publ. 5: 284-290.
- Jhingran, V. and K. Mishra. 1962. Further tagging experiments in the Chilka Lake (1959) with special reference to *Mugil cephalus*. *Indian J. of Fish.* 9 (2):476-498.
- Johnson, S.K. and W.A. Rogers. 1973. Distributions of the genus *Ergasilus* in several Gulf of Mexico drainage basins. *Bull. Alabama Agric. Exp. Stn.* 445: 1-74.
- Jordan, D.S. and B.W. Evermann. 1896. The Fishes of North and Middle America. Part I. Bull. 47, U. S. National Museum, pp. i-IX, 1-1240.

- Kelso, W.E., B.D. Rogers, D.A. Rutherford and D.R. Rogers. 1991. Survey of Louisiana Recreational Anglers - 1990. La. Ag. Exp. Sta. Mimeo Rept. 57. 65 pp.
- Kelso, W.E., B.D. Rogers, D.A. Rutherford and D.R. Rogers. 1992. Survey of Louisiana Recreational Anglers - 1991. La. Ag. Exp. Sta. Mimeo Rept. 68. 89 pp.
- Kilby, J.D. 1949. A preliminary report on the young striped mullet, *Mugil cephalus* L., in two Gulf coastal areas of Florida. Quart. J. Fla. Acad. Sci. 11:7-23.
- Kitao, T., R.K. Farrell and T. Fukuda. 1973. Differentiation of salmon poisoning disease and Elokomin fluke fever: fluorescent antibody studies with *Rickettsia sennetsu*. Am. J. Vet. Res. 34(7): 927-928.
- Kuo, C.M., C.E. Nash and Z.H. Shehadeh. 1974. The effects of temperature and photoperiod on ovarian development in captive grey mullet (*Mugil cephalus* L.). Aquaculture 3(1):25-43.
- Lazuski, H.G., W. Tatum and B. Perkins. 1989. An assessment of mullet landings and identification of essential population indicators and economic data base towards the establishment of MSY in the Fishery Conservation Management Zone, Gulf of Mexico. Alabama Marine Resources. MARFIN Report NA88WC-H-MF191.
- Leard, R., B. Mahmoudi, H. Blanchet, H. Lazauski, K. Spiller, M. Buchanan, C. Dyer and W. Keithly. 1995. The Striped Mullet Fishery of the Gulf of Mexico, United States: A Regional Management Plan. Gulf St. Mar. Fish. Comm., Ocean Springs, Ms. Number 33.
- Lee, C.S., C.S. Tamaru, C.D. Kelly, A. Moriwake and G.T. Miyamoto 1992. The effect of salinity on the induction of spawning and fertilization in the striped mullet, *Mugil cephalus*. Aquaculture 102:289-296.
- Legrande, W.H. and J.M. Fitzsimons. 1976. Karyology of the mullets *Mugil curema* and *M. cephalus* (Perciformes: Mugilidae) from Louisiana. Copeia 2:388-391.
- Lewis, D.H., L.C. Grumbles, S. McConnell and A.I. Flowers. 1970. *Pasteurella*-like bacteria from an epizootic in menhaden and mullet in Galveston Bay. J. Wildl. Dis. 6(3):160-162.
- Lightner, D.V. 1974. Case reports of ossifying fibromata in the striped mullet. J. Wildl. Dis. 10(4):317-320.
- Maharaj, V. and J.E. Carpenter. 1998. The 1996 economic impact of sport fishing in Louisiana. American Sportfishing Association. U.S. Fish and Wildlife Service Coop. Grant Agreement No. 14-48-0009-1237. 10 pp.

- Mahmoudi, B. 1989. Population assessment of black mullet (*Mugil cephalus*) in the eastern Gulf of Mexico. final Report of Coop. Agreement (MARFIN) NA86-WC-H-06138, Fl. Dept. of Env. Prot., St. Petersburg. 89 pp.
- Major, P.F. 1978. Aspects of estuarine intertidal ecology of juvenile striped mullet, *Mugil cephalus*, in Hawaii. Fish. Bull. 76:299-313.
- Marais J.F.K. 1985. Some factors influencing the size of fishes caught in gillnets in Eastern Cape estuaries. J. Fish. Research 3:251-261.
- Martin, F.D. and G.E. Drewry. 1978. Development of fishes of the Mid-Atlantic Bight. An atlas of egg, larval and juvenile stages. Vol. VI. Stromateidae through Ogcocephalidae. FWS/OBS-78/12.
- Massey, L.L. and D.E. Harper. 1993. Selected computer images of southeastern U.S. marine fishes. NOAA Tech. Memo. NMFS-SEFSC-333. 49 pp.
- McConnell, K.E., and I.E. Strand. 1994. The Economic value of Mid and South Atlantic sportfishing. University of Maryland, College Park.
- Moore, R.H. 1974. General ecology, distribution, and relative abundance of *Mugil cephalus* and *Mugil curema* on the south Texas coast. Contr. Mar. Sci. Univ. Tex. 18:242-255.
- Moore, R.H. 1976. Observations on fishes killed by cold at Port Aransas, Texas, 11-12 January 1973. Southwest Nat. 20:461-466.
- Nash, C.E., C.M. Kuo and S.C. McConnel. 1974. Operational procedures for rearing larvae of the grey mullet (*Mugil cephalus* L.). Aquaculture 3:15-24.
- National Marine Fisheries Service. 1964-94. Preliminary Commercial Fishery Statistics. Atlantic and Gulf Coast.
- Nordlie, F.G., W.A. Szelistowski and W.C. Nordlie. 1982. Ontogenesis of osmotic regulation in the striped mullet, *Mugil cephalus* L. J. Fish Biol. 20:79-86.
- Norris, D.E. and R.M. Overstreet. 1975. *Thynnascaris relinquens* sp. n. and *T. habena* (Linton, 1900)(Nematoda: Ascaridoidea) from fishes in the northern Gulf of Mexico and eastern U.S. seaboard. J. Parasitology 61(2):330-336.
- Odum, W.E. 1968. Mullet grazing on a dinoflagellate bloom. Chesapeake Sci. 9:202-204.
- Odum, W.E. 1970. Utilization of the direct grazing and plant detritus food chains by the striped mullet, *Mugil cephalus*. In: J.J. Steele, (ed). Marine Food Chains. Oliver and Boyd, Ltd., Edinburgh, Scotland. pp 222-240.

- Overstreet, R.M. 1974. An estuarine low-temperature fish-kill in Mississippi, with remarks on restricted necropsies. *Gulf Res. Rep.* 4 (3): 328-50.
- Overstreet, R.M.. 1990. Antipodean aquaculture agents. *International Journal for Parasitology*. Vol. 20 No. 4. pp 551-564.
- Paperna, I. and R.M. Overstreet. 1981. Parasites and diseases of mullets (Mugilidae). *In*: O.H. Oren, (ed.) *Aquaculture of grey mullets*. International Biological Program 26. Cambridge University Press, Cambridge, England. pp 411-493.
- Pearse, A.S. 1952. Parasitic crustacea from the Texas coast. *Publ. Inst. Mar. Sci., Univ. Tex.* 2(2):5-42.
- Perret, W.S., B.B. Barrett, W.R. Latapie, J.F. Pollard, W.R. Mock, B.G. Adkins, W.J. Gaidry and C.J. White. 1971. Cooperative Gulf of Mexico Estuarine Inventory and Study, Louisiana. Phase I, Area Description and Phase IV, Biology, La. Wildlife and Fisheries Comm. 175 pp.
- Perry, W.G. 1975. Brackish water pond culture experiments with Atlantic croaker, striped mullet, channel catfish, and rainbow trout. pp. 309-319 *in*: Avault, J.W., Jr., (ed.) *Proc. 6th Ann. Meet. World Maricult. Soc.*
- Perry, W.G. and J.W. Avault, Jr. 1972. Comparisons of striped mullet and tilapia for added production in caged catfish studies. *Prog. Fish-Culturist* 34(4):229-232.
- Peterson, C.H. 1976. Cruising speed during migration of the striped mullet *Mugil cephalus*: an evolutionary response to predation. *Evolution* 30:393-396.
- Pien, P. and I. Liao. 1975. Preliminary report of histological studies on the grey mullet gonad related to hormone treatment. *Aquaculture* 5 (1):31-39.
- Plump, J.A., J.H. Schachte, J.L. Gaines, W. Peltier and B. Carroll. 1974. *Streptococcus* sp. from marine fishes along the Alabama and northwest Florida coast of the Gulf of Mexico. *Trans. Am. Fish. Soc.* 103(2): 358-61.
- Randall, J.E. 1968. Caribbean reef fishes. T. F. H. Publications Inc. pp. 318.
- Rawson, M.V., Jr. 1973. The development and seasonal abundance of the parasites of striped mullet, *Mugil cephalus* L., and mummichogs, *Fundulus heteroclitus* (L.). Dissertation Univ. Georgia.
- Ray, S.M. and W.B. Wilson. 1957. Effects of unialgal and bacteria-free cultures of *Gymnodinium brevis* on fish. *Fish. Bull. US Fish Wildl. Serv.* 57 (123): 469-96.

- Render, J.H., B.A. Thompson and R.L. Allen. 1995. Reproductive development of striped mullet in Louisiana estuarine waters with notes on the applicability of reproductive assessment methods for isochronal species. *Trans. Am. Fish. Soc.* 124:26-36.
- Rivas, L.R. 1980. Synopsis of knowledge on the taxonomy, biology, distribution, and fishery of the Gulf of Mexico mullets (Pisces: Mugilidae). pp 34-53. *In*: M. Flandorfer and L. Skupien (eds). *Proceedings of a Workshop for Potential Fishery Resources of the northern Gulf of Mexico*. Miss-Ala. Sea Grant Consortium Publication MASGP-80-012.
- Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea and W.B. Scott 1980. A list of common and scientific names of fishes from the United States and Canada. *Am. Fish. Soc. Sp. Publ. No. 12*, 174 pp.
- Robins, C.R., G.C. Ray and J. Douglas. 1986. *A Field Guide to Atlantic Coast Fishes of North America*. Houghton Mifflin Co., Boston. 354 pp.
- Rossi, A.R., M. Capula and L. Sola. 1998a. Allozyme variation in global populations of striped mullet, *Mugil cephalus* (Pisces: Mugilidae). *Mar. Biol.* 131:203-212.
- Rossi, A.R., M. Capula, D. Crosetti, D.E. Campton and L. Sola. 1998b. Genetic divergence and phylogenetic inferences in five species of Mugilidae (Pisces: Perciformes). *Mar. Biol.* 131:213-218.
- Russell, S.J., J.H. Render, S. Ellsworth, R.M. Parker and G.W. Bane. 1986. King mackerel, snappers, groupers, and other coastal pelagic fishes - Louisiana. *Annual Report. Publ. No. LSU-CFI-86-11*, Center for Wetland Resources, La. St. Univ., Baton Rouge. 162 pp.
- Russell, S.J., R.M. Parker, F. Cole, L. Picou and D. Domengeaux. 1987. State/Federal Cooperative Fishery Statistical Program in Louisiana. *Annual Report 1986-87. Publ. No. LSU-CFI-87-12*.
- Sarig, S. 1971. The prevention and treatment of diseases of warmwater fishes under subtropical conditions, with special emphasis on intensive fish farming. *In*: S.F. Snieszko and H.R. Axelrod, (eds.) *Diseases of Fishes*. T.F.H. Publications Inc., Ltd., Hong Kong.
- Saunders, D.C. 1964. Blood parasites of marine fish of southwest Florida, including a new haemogregarine from the menhaden, *Brevoortia tyrannus* (Latrobe). *Trans. Am. Microsc. Soc.* 83 (2):218-225.
- Sawyer, R.T., A.R. Lawler and R.M. Overstreet. 1975. Marine leeches of the eastern United States and the Gulf of Mexico with a key to the species. *J. Nat. Hist.* 9 (6): 633-667.
- Shehadeh, Z.H., C.M. Kuo and K.K. Milisen. 1973. Induced spawning of grey mullet *Mugil cephalus* L. with fractionated salmon pituitary extract. *J. Fish. Biol.* 5:471-478.

- Shireman, J.V. 1964. Age and growth of striped mullet *Mugil cephalus* L., in Maringouin Bayou, Louisiana. La. Acad. Sci. 27:39-45.
- Shireman, J.V. 1975. Gonadal development of striped mullet (*Mugil cephalus*) in fresh water. Prog. Fish-Culturist 37:205-208.
- Simmons, E.G. 1957. Ecological survey of the upper Laguna Madre of Texas. Publ. Inst. Mar. Sci., Univ. Tex. 4:156-200.
- Sindermann, C.J. 1972. Some biological indicators of marine environmental degradation. J. Wash. Acad. Sci. 62 (2): 184-189.
- Skinner, R. 1974. Parasites of the striped mullet, *Mugil cephalus*, from Biscayne Bay, Florida, with descriptions of a new genus and three new species of trematodes. Thesis, Univ. Miami, Coral Gables.
- Suttkus, R.D. 1956. First record of the mountain mullet, *Agonostomus monticola* (Bancroft), in Louisiana. Proc. La. Acad. Sci. 19:43-46.
- Sylvester, J.R., C.E. Nash and C.R. Emberson. 1975. Salinity and oxygen tolerances of eggs and larvae of Hawaiian striped mullet, *Mugil cephalus* L. J. Fish Biol. 7:621-629.
- Sylvester, J.R. and C.E. Nash. 1975. Thermal tolerance of eggs and larvae of Hawaiian striped mullet, *Mugil cephalus* L. Trans. Am. Fish. Soc. 104(1):144-147.
- Tabb, D.C. and R.B. Manning. 1961. A checklist of the flora and fauna of northern Florida Bay and adjacent brackish waters of the Florida mainland collected during the period July, 1957 through September, 1960. Bull. Mar. Sci. Gulf & Carib. 11(4):552-649.
- Thompson, B.A., J.H. Render, R.L. Allen, and D.L. Nieland. 1989. Life history and population dynamics of commercially harvested striped mullet *Mugil cephalus* in coastal Louisiana. Final Report Louisiana Bd. Regents. Coastal Fisheries Institute, La. St. Univ. LSU-CFI-89-01 80 pp.
- Thompson, B.A., J. H. Render, R. L. Allen and D.L. Nieland. 1990. Fishery independent characterization of population dynamics and life history of striped mullet in Louisiana. Year Two. Coastal Fisheries Institute, La. St. Univ. LSU-CFI-90-01.
- Thompson, B.A., J.H. Render, R.L. Allen, and D.L. Nieland. 1991. Fishery independent characterization of population dynamics and life history of striped mullet in Louisiana. Final Report, Coop. Agreement (MARFIN) NA90AA-H-MF-113. Coastal Fisheries Institute, La. St. Univ. 92 pp.

- Thomson, J.M. 1955. The movements and migrations of mullet (*Mugil cephalus* L.). Aust. J. of Mar. and Freshw. Resour. 6:238-347.
- Thomson, J.M. 1963. Synopsis of biological data on the grey mullet *Mugil cephalus*, Linnaeus 1758. Aust. C.S.I.R.O. Division of Fisheries Oceanography. Fishery Synopsis 1. 66 pp.
- Titre, J.P., Jr., J.E. Henderson, J.R. Stoll, J.C. Bergstrom and V.L. Wright. 1988. Valuing wetland recreational activities on the Louisiana coast: Final report to U.S. Army Corps of Engineers, New Orleans District.
- Topp, R.W. and D.S. Beaumariage. 1971. Two unusual striped mullet, *Mugil cephalus*, from the Florida West Coast. Trans. Am. Fish. Soc. 100(3):579-580.
- Tung, I.H. 1970. Studies on the fishery biology of the grey mullet, *Mugil cephalus* L., in Taiwan. pp 497-504 In: John C. Marr (ed) The Kuroshio- A Symposium on the Japan Current. Eastwest Center Press, Honolulu. 614 pp.
- U.S. Department of the Interior, Fish and Wildlife Service. 1988. 1985 National survey of fishing, hunting, and wildlife associated recreation. U.S. Government Printing Office, Washington D. C.
- U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce Bureau of the Census. 1993. 1991 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Government Printing Office, Washington D. C.
- U. S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce Bureau of the Census. 1997. 1996 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Government Printing Office, Washington D. C.
- Wallace, J.H. 1975. The estuarine fishes of the east coast of South Africa. Part I. Species composition and length distribution in the estuarine and marine environments. Part II. Seasonal abundance and migrations. South African Association of Marine Biological Resources Investigation Report 40. 71 pp.
- Walsh, W.A., C. Swanson, C.-S. Lee, J.E. Banno, and H. Eda. 1989. Oxygen consumption by eggs and larvae of striped mullet, *Mugil cephalus*, in relation to development, salinity and temperature. J. Fish Biol. 35:347-358.
- Wilkie, D.W. and H. Gordin. 1969. Outbreak of cryptocaryoniasis in marine aquaria at Scripps Institution of Oceanography. Calif. Fish Game, 55 (3), 227-36.
- Yashouv, A. and E. Berner-Samsonov. 1970. Contributions to the knowledge of eggs and early larval stages of mullets (*Mugilidae*) along the Israeli coast. Bamidgeh 22:72-89.

BLACK DRUM 5.0 STOCK ASSESSMENT

This assessment uses yield-per-recruit (YPR) and Spawning Potential Ratio (SPR) to estimate the impact of fishing pressure on potential yield and the spawning potential of the black drum stock in Louisiana waters. Estimates derived from YPR and SPR are based on information regarding the growth rate and spawning potential of the fish, and on estimates of the natural mortality rate (M) and fishing mortality rate (F) on the stock. The results from this assessment provide a generalized approach towards estimating the impact of fishing on the spawning potential and potential yield of the fish stock. The spawning biomass of females is assumed to be the factor limiting the spawning potential of the stock; therefore, where possible, only data on female black drum are used. Yield-per-recruit and SPR analysis, as with many other generalized assessments, should be used only as a guide until a more comprehensive assessment can be conducted.

In developing a stock assessment, the unit stock must be defined. While a unit stock is often represented by that portion of the population which is genetically similar, for our purpose, the most applicable definition seems to be one which considers the unit stock as that portion of the population which is either dependent on Louisiana waters, or which is available to Louisiana fishermen.

5.1 Growth

Luquet (1996) presents several growth equations for black drum. The one chosen for this assessment was developed by Geaghan and Garson (unpublished), and is a sloped asymptote model fitted to a von Bertalanffy growth equation. The data used by Geaghan and Garson (unpublished) was from Beckman et al. (1988) who used otolith sections in aging fish caught in Louisiana waters. The sloped asymptote model proved to fit the data better than did other equations. The equation is as follows:

$$L_t = (610 + 9.959 * t) * (1 - e^{-0.6226(t-0.1229)})$$

where, L_t = length at age t , and t = age in years.

The length-weight regression described by Beckman et al. (1988) from fish harvested in Louisiana was used in this assessment. The equation is as follows:

$$\log(W) = 3.05 * \log(FL) - 4.943$$

where, W = weight in grams, and FL = fork length in millimeters.

5.2 Natural Mortality

Natural mortality is one part of total mortality (Z) and is the mortality due to all causes other than fishing. These include predation, disease, spawning stress, starvation, and old age. Typically, natural mortality is estimated, as it is difficult to directly measure, especially on exploited fish stocks where natural mortality and fishing mortality occur simultaneously.

This assessment follows the former Louisiana Department of Wildlife and Fisheries (1990) assessment in using a range of values for natural mortality (0.1, 0.15, 0.2) to evaluate the sensitivity of M on the resulting spawning stock.

5.3 Fishing Mortality

Fishing mortality estimates derived in the former Louisiana Department of Wildlife and Fisheries (1990) assessment were used in this assessment to evaluate the impact of current fishing regulations on the spawning potential of the stock. The former assessment did not address the concept of spawning potential as a management measure. Only recently has this concept become widely used.

The former assessment used the growth equation described in Section 5.1 to develop annual catch-at-age tables.

5.4 Yield-per-Recruit

Yield-per-recruit and SPR analysis provides basic information about the dynamics of a fish stock by estimating the impact of mortality on yield and the spawning potential of the stock. The results can be examined as to the sensitivity of natural and fishing mortality rates on yield and spawning potential.

The growth parameters described in Section 5.1, the age-specific fishing mortality rates described in Section 5.3, and the natural mortality rates described in Section 5.2 were incorporated into the yield-per-recruit and spawning potential analysis. Fecundity estimates derived by Wilson et al. (1992) were used to estimate spawning potential. The equation is as follows:

$$\ln(BF) = 0.76 * \ln(\text{Age}) + 12.24$$

where, BF =batch fecundity. The results are presented in Table 5.1, which contains estimates of F_{MAX} (fishing mortality rate that produces maximum yield), $F_{0.1}$ (fishing mortality rate representing 10% of the slope at the origin of a yield-per-recruit curve), $F_{20\%SPR}$ (fishing mortality that produces 20% SPR), $F_{30\%SPR}$ (fishing mortality that produces 30% SPR), and estimates of F from Section 5.3.

5.5 Conservation Standards

Conservation standards are intended to protect the viability of a fish stock for future generations. These standards have historically been based on a number of biological measures of the dynamics of fish stocks, depending on the availability and adequacy of data. Conservation standards should be separated into two types: a conservation threshold which is entirely biologically based and, a conservation target which considers biological measures modified by relevant social, economic, and ecological factors. A conservation threshold is a biological baseline for the harvest of a fish stock and should not be exceeded. It is the highest level of fishing mortality that will ensure that recruitment overfishing will not occur. Beyond the conservation threshold, a conservation target may be set, providing for other management goals in the fishery. Such goals may include maximizing yield in weight or numbers of fish, economic benefits or profit, employment, or some other measurable goal. These targets should be set at a fishing mortality rate below that of the conservation threshold in order to ensure that the biological integrity of the stock is not damaged by fishing.

The spawning potential ratio (SPR) concept described by Goodyear (1989), is a species specific value expressed as the ratio of the spawning stock biomass (or egg production) per recruit (SSB/R) in a fished condition to the SSB/R in an unfished condition. The concept is based on the premise that below some level of SPR, recruitment will be reduced. Goodyear (1989), recommends that in the absence of sufficient data to provide a value specific to the stock in question an SPR of 20% be used as a threshold. Work on North Atlantic ground fisheries also resulted in the calculation of a threshold SPR of 20% (Gabriel et al. 1984, Gabriel 1985). An SPR of 20% has been recommended for Spanish and king mackerel in the Gulf of Mexico (National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995), while an SPR of 8-13% has been demonstrated to be sufficient for gulf menhaden (Vaughan 1987). In earlier analyses of Louisiana spotted seatrout fisheries (Louisiana Department of Wildlife and Fisheries 1991), an SPR threshold of 15% was recommended based on several years of data. Mace and Sissenwine (1993) examined 90 stocks of 27 species, and reported that the average replacement SPR for all these stocks was 18.7%, while the most resilient quarter of the stocks required a maximum of only 8.6%. These authors recommended that an SPR of 30% be maintained when there is no other basis for estimating the replacement level, as this level was sufficient in maintaining recruitment for 80% of the stocks examined. However, they noted that 30% may be overly conservative for an "average" stock, and reiterated the need for stock-specific evaluations of standards to enhance both safety and benefits in the fishery.

Sufficient information is not available to directly estimate a conservation threshold for black drum in Louisiana. However, the conservation target of 30% SPR established by the 1995 Regular Session of the Louisiana Legislature for black drum, southern flounder, sheepshead, and striped mullet appears to be adequate to maintain the black drum stock and prevent recruitment overfishing.

The use of any measure of the health of a fish stock as a perfect index is arguable. It is logical to conclude that growth overfishing should occur at a much lower fishing rate than that which would threaten recruitment. However, Mace and Sissenwine (1993) provide information to suggest that some stocks may have reduced recruitment at levels of fishing that would not reduce yield-per-recruit. The preferable position for making recommendations on appropriate levels of fishing for a stock is to base those recommendations on actual measures of spawning stock size and recruitment for both the species and fishery in question. This requires a base of information resulting from monitoring of both the stock and the fishery over a variety of conditions. Without this information, conservation standards may either underestimate or overestimate the potential of a fishery. If the potential is underestimated, society loses the economic and social benefits of the harvest. If the potential is overestimated and the fishery is allowed to operate beyond sustainable levels, society loses the benefits of a sustainable fishery, and recovery will require some period of rebuilding, when effort must be reduced from the non-sustainable levels (Hilborn and Walters, 1993). Some researchers have speculated that overharvest of some stocks may lead to their replacement in the ecosystem by other, often less preferred, stocks. The frequency of such replacements is unknown, and the cause of shifts in species predominance in an ecosystem is difficult to ascertain, even after the fact. Such a shift has been reported in the Georges Bank area, where prolonged, intense harvest of cod and haddock has been implicated in gradual increases in skate and spiny dogfish populations (National Oceanic and Atmospheric Administration 1993).

5.6 Status of the Stock

Black drum were lightly exploited until the early 1980s when commercial harvest began to increase dramatically (Figure 5.1). Commercial landings went from 0.4 million pounds in 1980 to 8.7 million pounds in 1988. Regulations implemented in 1989 reduced the commercial harvest to between 2 and 4 million pounds annually. Regulations implemented in 1995 (ACT 1316) may have reduced harvest even further as evidenced in 1996 and 1997, where landings were less than 2 million pounds. Harvest from the recreational fishery fluctuated, between 0.5 and 2.7 million pounds, for the years prior to regulation (1981-1988), and 0.4 to 1.3 million pounds post-regulations (Figure 5.2). Recreational harvest since regulations were implemented in 1989 have remained stable. Mean catch-per-trip from the recreational fishery was calculated by selecting those trips that had black drum in their catch. The results are presented in Figure 5.3 along with 95% confidence limits around the mean. The catch-per-unit-effort (CPUE) indices cycled throughout the period examined (1981-1997), with no indication of a long-term downward trend. The years 1985, 1991 and 1996 showed the lowest CPUE and only significantly lower than 1982, 1986, 1993 and 1994. Catch-per-effort data from the Departments, fishery-independent trammel net (750' - 1 5/8" inner, 6" outer wall) and small mesh bag seine (50' - 1/4" delta mesh) samples were calculated as follows:

$$\text{Mean CPUE} = (\exp (\sum \ln (\text{catch} + 1) / N)) - 1$$

where, catch is the total number caught in each set and, N is the number of samples taken annually. Trammel net and seine data were used for the period 1986-1998. The CPUE fluctuates throughout the time period in both the seine and trammel net samples with no indication of a long-term downward trend (Figure 5.4 and 5.5). The year 1988 was the only year where CPUE in seines showed any significant difference at the 95% confidence level and, only lower than 1986, 1992, 1996 1997 and 1998. Trammel net CPUE was highly variable throughout the period as indicated by the wide confidence limits associated with the years examined. The years 1986, 1988 and 1989 had the lowest CPUE, and only significantly lower than 1996 and 1998.

Rules for the harvest of black drum changed recently. Commercial harvest methods were changed on August 15, 1995 when Act 1316 of the 1995 Regular Legislative Session, the Marine Resources Conservation Act of 1995, became effective. This act outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted black drum harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest black drum, and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and commercial harvesters must utilized other legal commercial gear to harvest black drum. This set of regulations had the effect of reducing the harvest of black drum by this segment of the commercial fishing industry.

It should be noted that the following results of YPR and SPR analysis do not reflect the impact of current regulations described above. With this type of general assessment, it will take several years before the impact of regulations will be observed in the disappearance rates from the fishery.

The results of YPR analysis indicate that if $M=0.1$ (the most conservative value within the range of estimates), the fishery prior to existing regulations (Act 1316) was operating above $F_{0.1}$ and below F_{MAX} with yield of 92% of maximum, and SPR at 42%. An M of 0.15 or 0.2 would indicate a more lightly fished stock with yield being 67% to 45% of maximum and with SPR being 56% to 67% respectively (Table 5.1).

5.7 Research and Data Needs

Estimates of natural mortality used in the present assessment show wide variation. This variation reduces the reliability of the present assessment in providing an accurate prediction of the potential yield of the stock, and also reduces the confidence level of the present estimate of SPR. A more precise estimate of natural mortality would assist in both of these problems.

Annual age-length keys should continue to be developed to provide catch-at-age data necessary to conduct age-based population assessments. The department is in the process of collecting otoliths for development of annual age-length keys.

January 13, 1999

The relationship between wetlands losses or modifications and the continuation of fishery production within the state has been discussed by many authors. However, this relationship is likely to be different for the various fishery species. Understanding this relationship for black drum should be an ongoing priority.

In the presence of changing regulations, fishery-dependent information is not a reliable source of data for assessing the status of a fish stock. However, such data are necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundance. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

BIBLIOGRAPHY

- Beckman, D.W., C.A. Wilson, R.M. Parker, D.L. Nieland, and A.L. Stanley. 1988. Age structure, growth rates, and reproductive biology of black drum in the northern Gulf of Mexico off Louisiana. 1986- 87 Final Rept. to USDC, MARFIN
- Gabriel, W.L. 1985. Spawning stock biomass per recruit analysis for seven Northwest Atlantic demersal finfish species. NMFS-NEFC. Woods Hole Lab. Ref. Doc. 85-04.
- Gabriel, W.L., W.J. Overholtz, S.A. Murawski and R.K. Mayo. 1984. Spawning stock biomass per recruit analysis for seven Northwest Atlantic demersal finfish species, Spring, 1984. NMFS-NEFC Woods Hole Lab. Ref. Doc. 84-23.
- Geaghan, J. and G. Garson. Unpublished. Population dynamics and stock assessment of black drum, Louisiana waters. 1989 Rept. to chairman of Louisiana SASC and TWG.
- Goodyear, C. P. 1989. Spawning stock biomass per recruit: the biological basis for a fisheries management tool. ICCAT Working Document SCRS/89/82. 10p.
- Hilborn, R. and C. J. Walters. 1992. Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty. Chapman and Hall, New York. 570 pp.
- Louisiana Department of Wildlife and Fisheries. 1990. Black drum management plan. LDWF Fishery Management Plan, March 1990 (Draft).
- Louisiana Department of Wildlife and Fisheries. 1991. A stock assessment for Louisiana spotted seatrout, (*Cynoscion nebulosus*). LDWF Fishery Management Plan Series, Number 3 (Draft).
- Luquet, C. 1996. A biological and fisheries profile for black drum (*Pogonias cromis*) in Louisiana. La. Dept. of Wildlife and Fisheries, Office of Fisheries. Fisheries Management Plan Series No. 7, Pt. 1.
- Mace, P.M. and M.P. Sissenwine. 1993. How much spawning per recruit is enough? pp. 101-118 in S. J. Smith, J. J. Hunt and D. Rivard (eds.) Risk Evaluation and Biological Reference Points for Fisheries Management. Can. Spec. Publ. Fish. Aq. Sci. 120. 442pp.
- National Oceanic and Atmospheric Administration 1993. Our Living Oceans: Report on the Status of U.S. Living Marine Resources, 1993. NOAA Tech. Memo. NMFS-F/SPO-15. 156 pp.

January 13, 1999

National Oceanic and Atmospheric Administration/National Marine Fisheries Service 1995. 1995 Report of the mackerel stock assessment panel. Miami Lab.Con. MIA- 94/95-30 March 1995

Vaughan, D.S. 1987. A stock assessment of the gulf menhaden, (*Brevoortia patronus*), fishery. NOAA NMFS Tech. Rep. 58, 18 pp.

Wilson C.A., D.W. Beckman, D.L. Nieland, and A.L. Stanley. 1992. The variation of year-class strength and annual reproductive output of red drum, (*Sciaenops ocellatus*), and black drum, (*Pogonias cromis*), from the northern Gulf of Mexico. 1990- 91 Final Rept. to USDC, MARFIN

Table 5.1 - Results of Yield Per Recruit and SPR Analysis for Black Drum

M=0.1

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	1.000	3.0259	1,889,656	21.80%	100.00%	Benchmarks
F0.1 =	0.260	2.4809	4,668,498	53.87%	81.99%	
F20% =	1.084	3.0223	1,733,321	20.00%	99.88%	
F30% =	0.705	2.9862	2,599,982	30.00%	98.69%	
* Regulations =	0.426	2.7925	3,655,175	42.18%	92.29%	Estimate

M=0.15

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	2.100	2.1766	426,128	10.85%	100.00%	Benchmarks
F0.1 =	0.605	1.7506	1,704,392	43.40%	80.43%	
F20% =	1.405	2.1260	785,399	20.00%	97.67%	
F30% =	0.971	1.9981	1,178,098	30.00%	91.80%	
* Regulations =	0.376	1.4562	2,201,492	56.06%	66.90%	Estimate

M=0.2

	F Ratio	YPR	SPR	%SPR	%YPR	
Fmax =	3.000	1.8019	134,357	6.51%	100.00%	Benchmarks
F0.1 =	1.153	1.5197	625,337	30.32%	84.34%	
F20% =	1.633	1.6709	412,499	20.00%	92.73%	
F30% =	1.165	1.5248	618,749	30.00%	84.62%	
* Regulations =	0.326	0.8173	1,375,910	66.71%	45.36%	Estimate

* Regulations prior to 1995 and Act 1316

Figure 5.1 - Commercial Harvest of Black Drum
in Louisiana

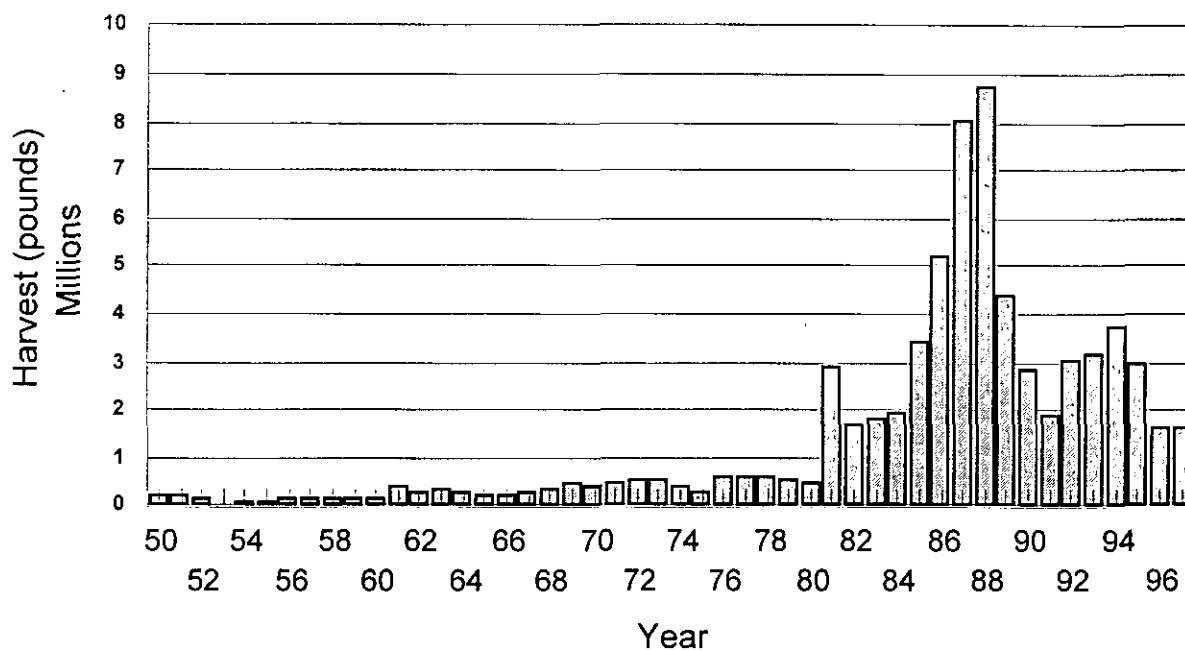
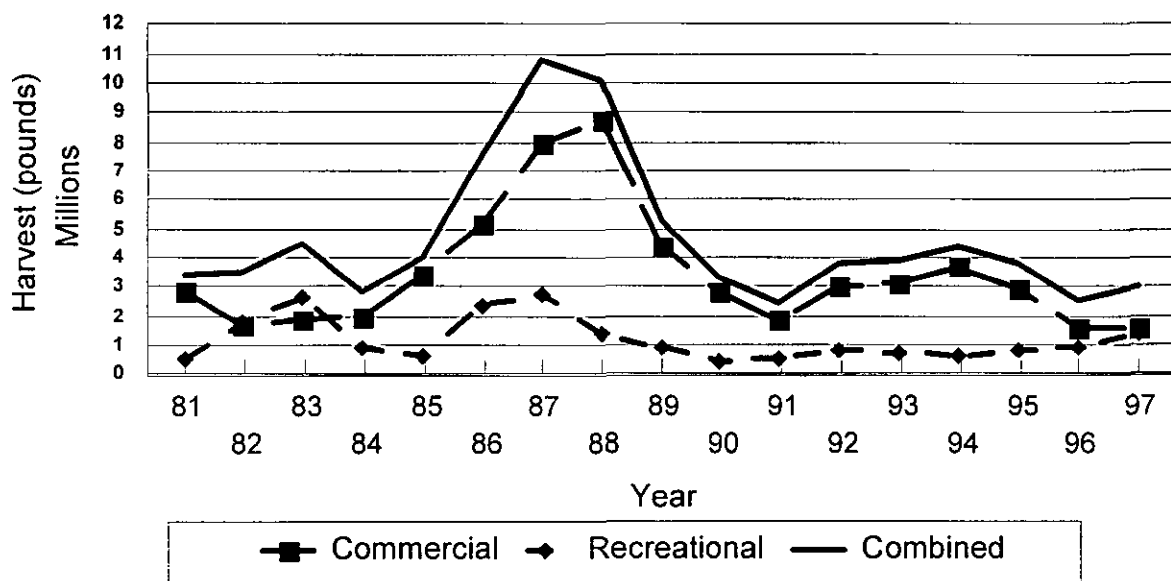
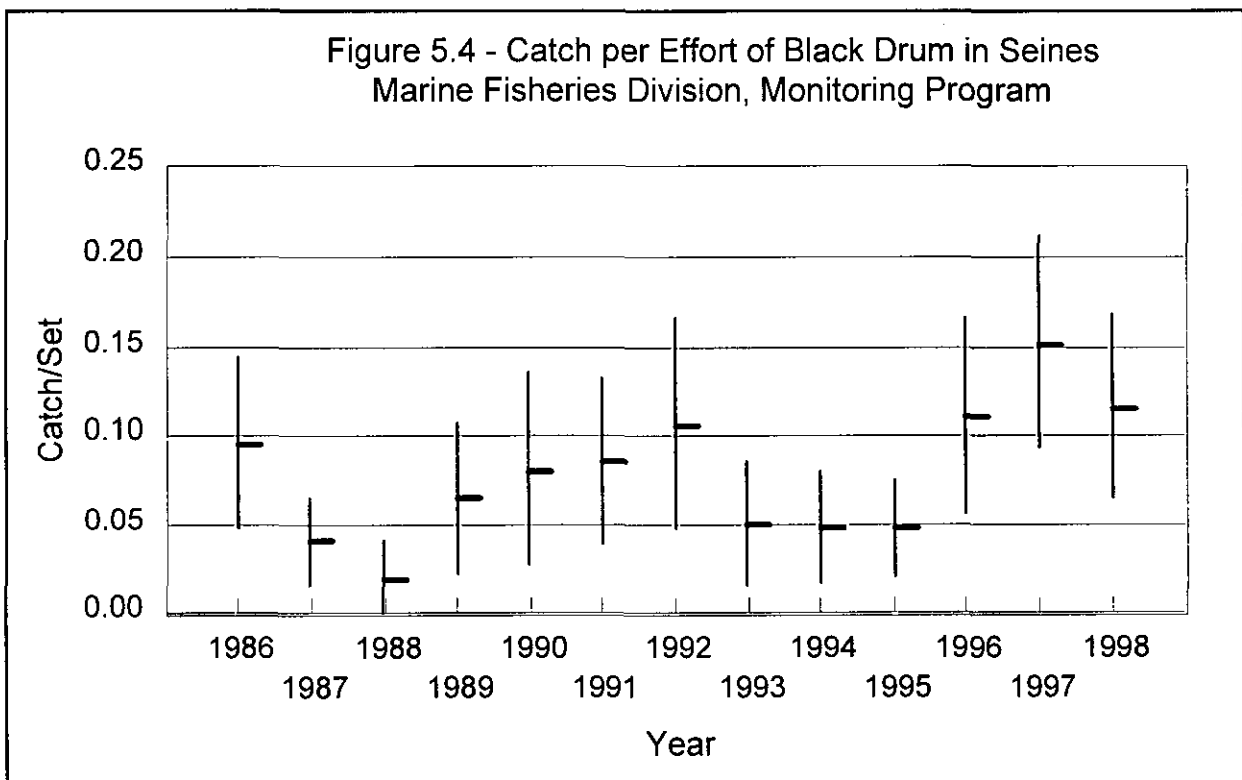
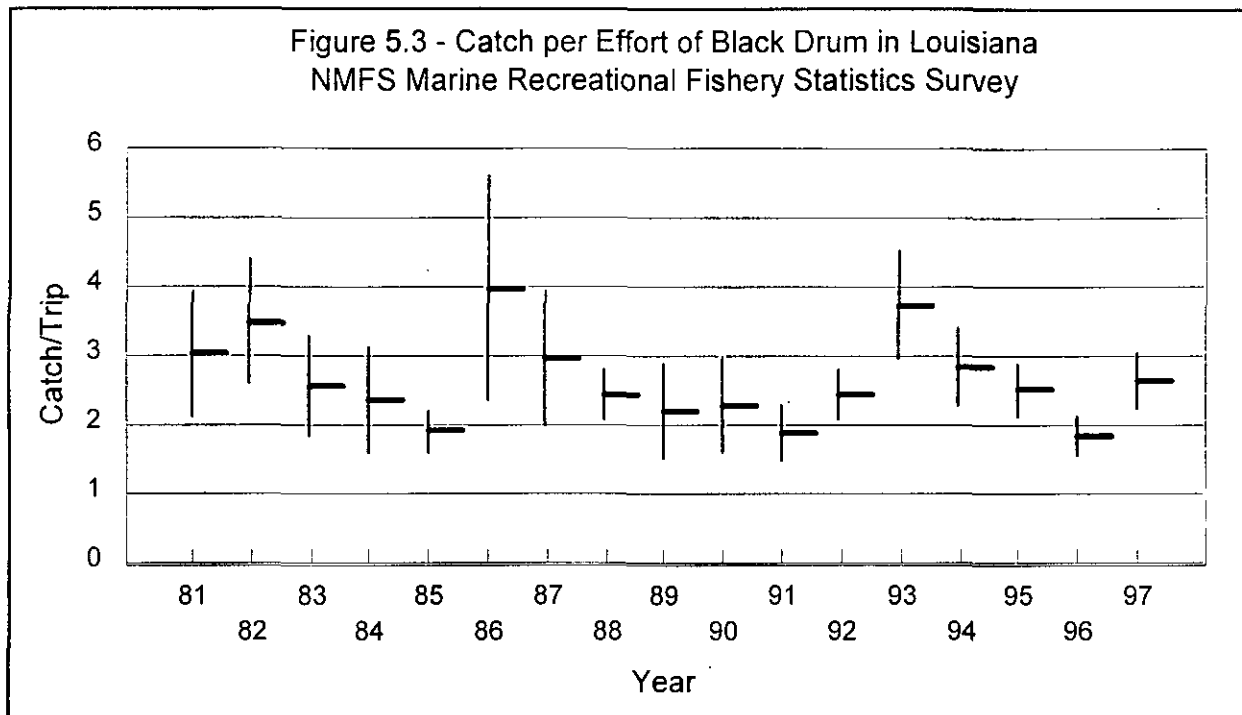
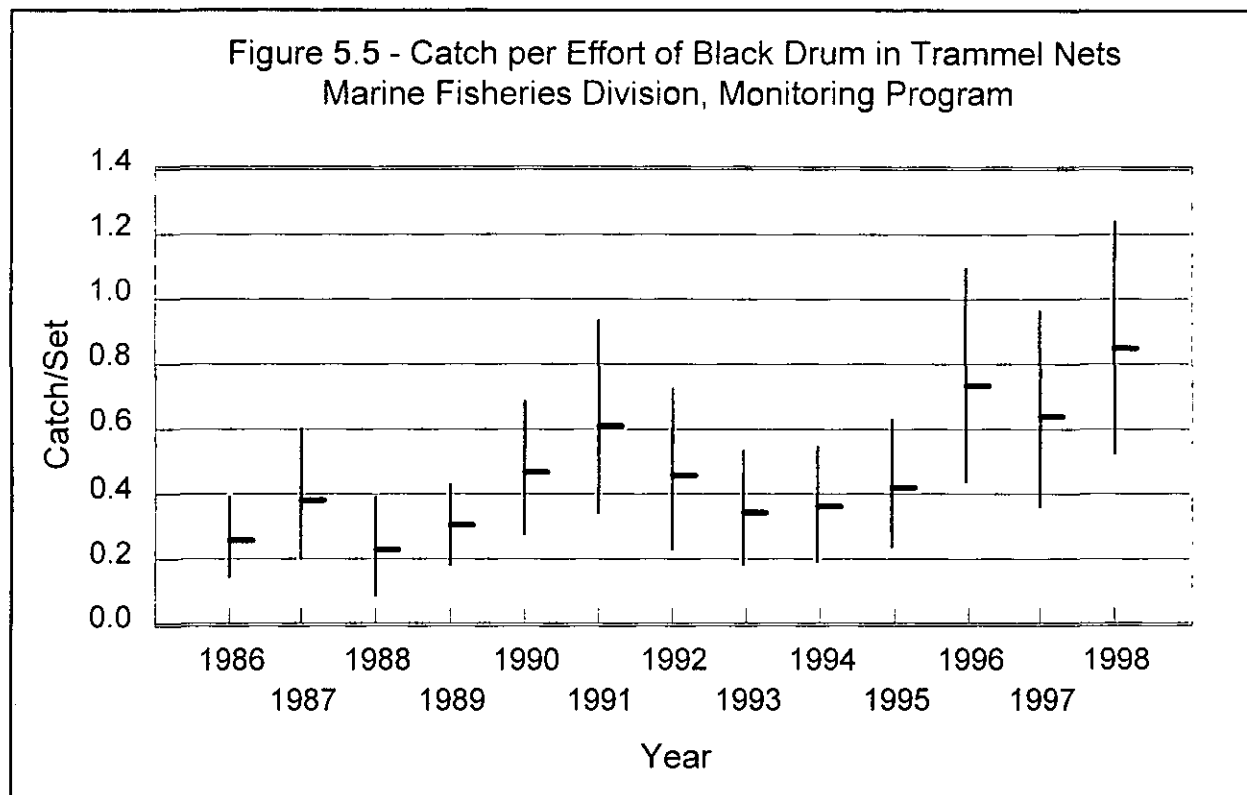


Figure 5.2 - Louisiana Commercial and Recreational Harvest
of Black Drum

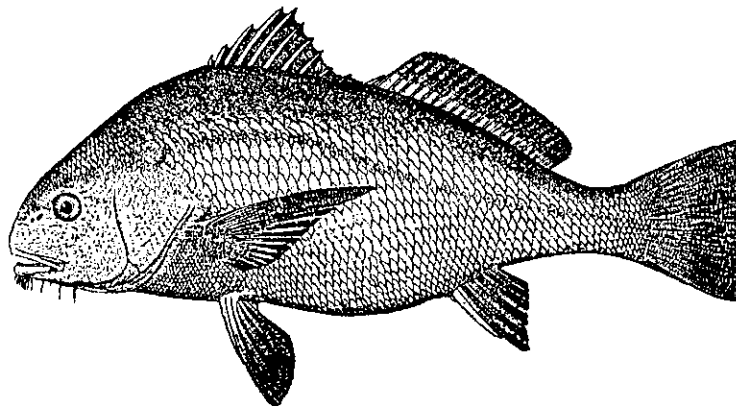






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Louisiana Department of Wildlife and Fisheries

Office of Fisheries



Fisheries Management Plan Series

Number 2, Part 1

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LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES

BATON ROUGE, LOUISIANA

A BIOLOGICAL AND FISHERIES PROFILE FOR BLACK DRUM,

Pogonias cromis IN LOUISIANA

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C. Luquet, Jr.

1.0 INTRODUCTION

The black drum, *Pogonias cromis*, is one species of the 14 genera of the family Sciaenidae recorded along the Atlantic and Gulf coasts of the United States (Chao 1978). The Sciaenidae is commonly known as the drum or croaker family, because drumming sounds are produced by many of its members including the black drum. The black drum is the largest member of the croaker family found in the region (Hoese and Moore 1977), with adults often exceeding 50 pounds. Chao (1978) reviewed the sciaenids of the western North Atlantic, and presented a phylogeny based on external morphology and the morphologies of the swim bladder and otoliths. Black drum is the accepted common name for *Pogonias cromis* (Robins *et al.* 1980). Other common names include drum, sea drum, gray drum, banded drum, big drum, *corvinon negro* (Mexico), and *tambour* (La. French) (Gowanloch 1933, Hoese and Moore 1977).

1.1 Status of the Fishery

The black drum has become one of the most highly sought after commercial finfish in Louisiana. Although its desirability among recreational fishermen may have increased to some degree, it still is not a preferred recreational fish.

Gear of the recreational and commercial sectors of the black drum fishery are capable of catching from all year classes. Due to current regulations, harvest primarily is concentrated on fish two years and older. Black drum of ages from five to 10 years (approximately 8 to 12 pounds) have been commercially exploited to a lesser extent than other year classes due to their decreased availability to the fishery. Behavioral changes may make these year classes less susceptible to the gear and methodology of the commercial fishermen (Ramsey and Wakeman 1989).

Information collected since the 1960's indicates that black drum harvest ranked low among recreationally harvested finfish species. In 1984 a Louisiana Department of Wildlife and Fisheries (LDWF) survey of marine recreational fishermen in Louisiana indicated that 0.6% of the recreational fishing effort was targeted towards black drum and that black drum constituted 3.3% of the total recreational catch. Marine Recreational Fishery Statistics Survey (MRFSS) data suggests that from 1980 to 1996 the percentages of recreational fishermen targeting drums ranged from 0.1% to 2.3%. In Louisiana these fishermen harvested an average of 376,713 black drum annually from 1980 through 1996.

During the 1980's the commercial black drum fishery underwent a period of rapid expansion due to a number of factors including increased participation in commercial fishing in general, better marketability of large black drum, a rise in the demand for finfish as a food source, and increased regulation of the harvest of other finfish. Louisiana commercial landings averaged 3,871,800 pounds annually from 1980 through 1989. In 1987 and 1988 commercial black drum

landings exceeded those of all other finfish landed in Louisiana excluding menhaden and yellowfin tuna. Regulations were established in 1989 and 1990, including conservation standards and commercial quotas. In 1989 the commercial black drum landings showed a decline for the first time, to 1986 levels. 1990 through 1994 landings increased slightly and averaged 2,944,000 pounds annually; but 1994 black drum landings slipped to fourth place behind tuna, the expanded mullet fishery, and menhaden. In 1995 landings began to decrease, and 1997 figures indicate a further decline to early 1980's levels.

Recent commercial regulations have decreased Louisiana black drum landings by eliminating the use of entangling netting gear, and through reduced harvest of adult drum in shrimp trawls with the use of turtle excluder devices (TED's), etc. Resultant changes in effort, fishing location, gear, and markets will determine future commercial landings within established conservation standards and within existing regulations that define quotas and possession limits.

2.0 BIOLOGY

2.1 Taxonomy and Nomenclature

The classification follows that of Greenwood *et al.* (1966). Taxa above superorder are not included.

Superorder: Acanthopterygii

Order: Perciformes

Suborder: Percoidei

Family: Sciaenidae

Genus: *Pogonias*

Species: *cromis*

The valid name for the black drum is *Pogonias cromis* (Linnaeus). The following synonymy is abbreviated from Jordan and Evermann (1896).

Labrus cromis, Linnaeus, 1766

Labrus chromis, Schöpfung, 1788

Pogonias fasciatus, Lacépède, 1802

Mugil grunniens, Mitchill, 1814

Mugil gigas, Mitchill, 1814

Sciaena fusca, Mitchill, 1815

Sciaena gigas, Mitchill, 1815

Labrus grunniens, Mitchill, 1815

Pogonias chromis, Cuvier and Valenciennes, 1830

2.2 Distribution and Abundance

Black drum are found along the western Atlantic coast from the Bay of Fundy, Nova Scotia, southward into the Gulf of Mexico and south to Argentina (Gilhen 1986). They are common from New Jersey southward, more common from Chesapeake Bay to the mouth of the Rio Grande, and are most abundant in the Gulf of Mexico along the Texas and Louisiana coasts in both state waters and the federal Exclusive Economic Zone (EEZ) (Welsh and Breder 1923, Silverman 1979, National Marine Fisheries Service (NMFS) landing statistics).

Black drum are common coastwide in all of Louisiana's estuarine and offshore waters at various times of the year. East of the Mississippi River black drum are more abundant, and large drum can be found inshore, from March through September. Large black drum can be found offshore during fall and winter months. West of the Mississippi, both large and small drum are more available November through March (Pearce 1989).

2.3 Stock Identification

The black drum ranges throughout the coastal and estuarine waters of Louisiana, and there is little evidence to suggest separate stocks gulfwide, though regional differences may be present. Ramsey and Wakeman (1989) analyzed black drum taken from gulfwide samples, from both inshore and offshore areas, for 21 protein systems. These showed that populations in the eastern Gulf of Mexico had a very low degree of variability, the lowest reported for any sciaenid fish. Allele frequencies and cluster analyses of the Texas populations did show strong separation from the eastern Gulf and may indicate a separate genetic stock. Gold *et al.* (1994) checked gulfwide samples for genetic variation using mitochondrial DNA (mtDNA). They also found that black drum populations tested had "little evidence of phylogeographic structuring... and are not strongly differentiated genetically." Gold *et al.* (1994) noted that black drum from neighboring localities had greater variation than red drum (*Sciaenops ocellatus*) (indicating less frequent interestuarine migration than red drum); and that black drum from their western Gulf samples had two haplotypes that differed from the central and eastern Gulf samples, revealing an "isolation-by-distance effect." Karel *et al.* (1995) further substantiated this effect and noted additional evidence of nonrandom distribution of alleles in Texas bays.

2.4 Morphology

2.4.1 Eggs

Black drum egg morphology is typical of the sciaenids making it difficult to distinguish their eggs from others of the family (Joseph *et al.* 1964) Figure 1, D-G. They described the buoyant eggs as having a size (converted from ocular units) ranging from 0.816 to 1.020 millimeters (mm), with a mean diameter of 0.928 mm, with 2 to 6 oil globules (average 2 to 3), coalescing to a single globule prior to hatching. Daniel and Graves (1994) indicated that the only methods to positively identify congeneric sciaenid eggs to species are to raise them or use electrophoresis. Daniel and Graves (1994) and Holt *et al.* (1988) narrowed Joseph's ranges for black drum egg diameters to >0.90 mm and averaging 1 mm.

The morphology of black drum eggs was described by Joseph *et al.* (1964) from collections of wild-caught eggs in the Chesapeake Bay area. These authors also provided a description of black drum larvae hatched from the egg up to 8.0 mm total length (TL). Pearson (1929) described larval black drum from Texas collections from 4.5 mm to adult sizes, Jannke (1971) illustrated 3.5 and 5.5 mm specimens, and Powles and Stender (1978) provided descriptions and morphometry of a small collection of 3.9 to 4.6 mm drum larvae.

2.4.2 Larvae

Larvae from cultured eggs ranged from 1.9 to 2.4 mm TL, and from 0.7 to 0.8 mm in depth at hatching; their yolk became exhausted after the fourth day at sizes of approximately 3.0 mm (Joseph *et al.* 1964) (Figure 2). Larvae less than 2.0 mm TL have a continuous finfold which is deepest behind the vent, the dorsal extending almost around the snout. The anus is located just behind the yolk sac. Pigmentation consists of small indistinct melanophores on the head and sides of the abdomen, behind the vent, and along the dorsal and ventral margins of the mid-caudal region. At approximately 2.8 mm TL (two days after hatching) the finfold is still large and pectoral fin buds are present; pigmentation on the head and trunk is more complete, and there are two large branching melanophores on the ventral and dorsal margins of the mid-caudal region. At about 4.5 mm TL two groups of branching melanophores appear on the tail, one slightly posterior to and above the vent, the other at the base of the anal fin bud. When about 5.5 mm TL three weak spines are present on the preopercle; caudal, dorsal, and anal fins are generally differentiated; and Pearson (1929) noted, six anal rays are usually discernible at this time, separating the species from related ones.

2.4.3 Juveniles

The full compliment of rays is present at 8 mm. Melanophores appear dorsally and laterally in groups which begin to form the five or six vertical black bars which remain until the adult size is reached. At 12 mm TL fins are fully developed. By 13-14 mm TL the melanophores have coalesced to form the vertical bars. At 15 mm TL young drum have assumed the general adult shape, and acquired 11 of the mandibular barbels characteristic of the adults. Scales begin to form posteriorly along the lateral line. All fins, with the exception of the dorsal, are unpigmented (Pearson 1929, Joseph *et al.* 1964, Silverman 1979). Fish at 22 mm are fully scaled and 17 barbels are present (Thomas 1971) (Figure 2).

2.4.4 Adults

The following description of the black drum adult is compiled from Jordan and Evermann (1898), Hildebrand and Schroeder (1928), Simmons and Breuer (1962), Miller and Jorgenson (1973), Richards (1973), Chao (1976), Chao (pers. comm. to G. D. Johnson cited in Johnson 1978), and Johnson (1978):

One deeply divided dorsal fin, the first part with 10 spines, the second with 1 spine and 19-23 segmented rays; anal fin with 2 spines and 5-7 rays; caudal with 9 dorsal and 8 ventral primary rays, 8-9 dorsal and 8 ventral procurrent rays; ventral fins with 1 spine and 5 rays; scales 41-45 in a lateral series; 10 trunk and 14 caudal vertebrae; 4-6 dorsal and 12-16 ventral gill rakers; 7 branchiostegals. Preopercular margin smooth. Teeth in jaws small, set in broad bands, none especially enlarged; no teeth on vomer, palatines or

tongue; lower pharyngeals large, completely united, with many blunt molars at the middle and surrounded by strong conical teeth (Figure 6).

Body oblong, moderately compressed, back much elevated; ventral outline nearly straight, head moderately short, snout blunt; mouth horizontal, inferior, lower jaw included; maxillary scarcely reaching below middle of eye; chin with 5 pores and 12 to 13 pairs of barbels along inner edges of lower jaw, the series usually extending back to below middle of eye. Scales firm, ctenoid. Dorsal fin continuous, with a deep notch between the spinous and soft portions; dorsal spines stiff and slender, the third longest; anal fin short, the second spine much enlarged; caudal fin subtruncate; pectoral fins about as long as head. Body proportions as follows: head 2.9-3.4, depth 2.3-2.8, pectoral fin 3.3-3.6 in standard length; snout 2.8-3.7, eye 2.8-3.9, interorbital 3.0-4.0, maxillary 2.5-3.3 in head.

Pigmentation: Color in life blackish with brassy luster, dark above; grayish white below, all fins dusky or black. Color varies somewhat with habitat; in Gulf of Mexico almost uniformly silvery, lose crossbars early; in bays and lagoons darker, often bronze along back and dirty white on sides and belly.

2.5 Reproduction

Black drum ova undergo a maturation process during which four distinct stages can be discerned: primary growth (PG), cortical alveolar (CA), vitellogenic (V), and hydrated (H). Histological examinations of black drum ovarian tissues and descriptions of each maturation stage are described by Fitzhugh *et al.* (1987) and Parker *et al.* (1988).

Bumgardner *et al.* (1995) explained apparent conflicts in historical age at maturity by documenting a population of drum that had matured at age two in Upper Laguna Madre. Previously, based on scale and length frequency studies, Pearson (1929) and Simmons and Breuer (1962) determined that Texas black drum mature at age two. Current evidence indicates that most black drum in the northern Gulf of Mexico mature sexually between four and five years of age; the most commonly encountered first age at sexual maturity is four years. Using aging analyses of otolith annuli, Nieland and Wilson (1993) reported the earliest occurrence of vitellogenesis for females and presence of milt in males to be age three among Louisiana black drum.

Fitzhugh *et al.* (1987) state that male and female drum mature sexually at between 600 and 640 mm (23.6 and 25.2 in.) as defined by the size at which 50% of individuals exhibit gonadogenesis. Murphy and Taylor (1989) found that in drum from Florida's Atlantic coast >50% of males and females matured at 590 mm TL (age 4 or 5) and 650 mm TL (age 5 or 6), respectively. Nieland and Wilson (1993) also noted a smaller size at maturation for male drum in samples from the northern Gulf of Mexico. Males matured (>50%) at age 4, 610-620 mm fork length (FL) and females (\approx 100%) at age 5, 640-649 mm FL.

Black drum are group synchronous, batch spawners (Wallace and Selman 1981) in which two populations of oocytes in ovarian tissues can be distinguished during the spawning season: a synchronous population of late stage oocytes comprising the leading clutch, and a population of smaller less mature oocytes (Fitzhugh *et al.* 1987, Parker *et al.* 1988). The result is a bimodal distribution of oocyte maturation stages within the ovary. Pearson (1929) estimated a 1000 mm (39.4 in.) female taken from Texas waters to contain nearly 6 million eggs averaging 0.6 mm in diameter. Fitzhugh *et al.* (1987), using direct counts of hydrated oocytes, reported a batch fecundity range of 0.7 million to 3.8 million ova for females taken in the 1986-1987 spawning season. Extrapolating this fecundity and an individual spawning frequency of seven days over a 16 week spawning season yielded a seasonal fecundity range of 11-60 million ova. Using similar protocol on 23 gravid females captured during the 1987-1988 spawning season, Parker *et al.* (1988) estimated mean black drum fecundity as 2,764 hydrated oocytes/gm ovary (range 1,587 - 4,085) or 1.35 million ova per batch (range 0.2 - 6.1 million). Extrapolation of these data yielded a seasonal fecundity of over 40 million ova per female for the 1988 spawning season. Fitzhugh *et al.* (1993) computed batch fecundity at 1.6 million eggs for the average sized female with hydrated oocytes (6.1 kg eviscerated weight) taken in 1986 and 1987. Nieland and Wilson (1993) estimated averages of 1.22, 1.65, and 1.21 million ova for years 1988, 1989, and 1990 respectively. Factors such as nutritional state and environment, may be important in variation in the batch fecundity rate (Nieland and Wilson 1993). Bumgardner *et al.* (1995) cited a maximum batch fecundity of 66 million, much greater than those cited previously, and on the order of other estimates of annual fecundity. They also reported a median batch fecundity of 1,015,500 eggs, with samples composed mainly of fish 5 years of age or younger. Their techniques used percentage of advanced oocytes (diameter >0.45 mm after adjusting for shrinkage in fixative) from preserved samples, and they suggested that this method may provide larger estimates of batch fecundity than those obtained from hydrated oocytes.

Spawning frequency, or the number of days between individual successive spawns, was calculated by Fitzhugh *et al.* (1987) as approximately seven days using postovulatory follicles (POF) and hydrated ova as indicating recent or imminent spawning. Parker *et al.* (1988), using the POF method of Hunter and Macewicz (1985), determined that the spawning frequency for the 1987-1988 season was approximately every 3.5 days. Thus, extrapolated over a probable four month spawning season, a single female black drum may spawn 20-30 times per season. Fitzhugh *et al.* (1993), and Nieland and Wilson (1993), also found evidence of spawning intervals of 3 to 4 days. Bumgardner *et al.* (1995) reported an estimate of 2.2 days, though their technique used the presence of advanced oocytes rather than POFs.

Relationships between black drum fecundities and length, mass, and age are still poorly understood, though Nieland and Wilson (1993) found positive correlations. They noted that eviscerated body weight was the best predictor of batch fecundity within seasons. Their data also indicated no sign of senescence.

Conflicting reports of the black drum spawning season in the Gulf of Mexico have been reported in the literature. Pearson (1929) stated that black drum in Texas waters spawn principally

from February to May, but may also undergo a secondary spawn from late July to November. Simmons and Breuer (1962) found ripe females from December through June, but remarked that the majority of spawning in Texas occurred in February and March with a secondary peak of spawning activity in May or June. A more recent study of black drum in Texas (Cody *et al.* 1985) stated that spawning occurs from November through April with a peak of activity occurring in January to April. Jannke (1971) reported a November to March spawning season for black drum in the Florida Everglades. Murphy and Taylor (1989) reported that spawning occurred from January through April on Florida's northeast coast. Peters and McMichael (1990) found spawning drum from November through May. Larvae were captured in coastal Louisiana waters in several plankton collections from December through April (Ditty 1986). It was noted by Leard *et al.* (1993) that spawning seasons were longer in more southern localities.

Histological examinations of ovarian tissues have been used to define spawning season of black drum in Louisiana waters (Fitzhugh *et al.* 1987, Parker *et al.* 1988, Fitzhugh *et al.* 1993, Nieland and Wilson 1993). Over the period 1987-1990, early stage maturing oocytes (CA) were found in late October to early November samples (Figure 3). By December of each year later stage vitellogenic oocytes were common indicating imminent spawning. Postovulatory follicles (POF), definitive evidence of recent spawning, were first detected in mid-February 1987 and mid-January 1988. Females with hydrated oocytes sampled in early December 1988 would account for the occurrence of larval black drum in Louisiana waters during this season as reported by Ditty (1986). The end of the spawning season, as indicated by late stage atresia (reabsorption) of yolked oocytes, is May. No evidence of a secondary peak in spawning activity has been observed in Louisiana waters.

Increases in both female and male gonosomatic indices (GSIs) correspond to the late autumn increase in oocyte maturation and further serve to delineate the black drum spawning season (Fitzhugh *et al.* 1987, Parker *et al.* 1988, Nieland and Wilson 1993). Mean GSIs for both sexes show precipitous increases beginning late October to mid-November, peaking in March. A return to near resting levels is noted by May. Data from 1987 to 1990 indicate that GSIs in both sexes displays a single annual peak (Figure 4).

In Louisiana, ripe black drum were found at water temperatures of 15-25 °C (60.8-77.0 °F) from January to May (Fontenot and Rogillio 1970, Saucier and Baltz 1993).

A review of literature sources (Pearson 1929, Simmons and Breuer 1962, Jannke 1971, Osburn and Matlock 1984, Fitzhugh *et al.* 1987, Parker *et al.* 1988, Saucier and Baltz 1993) indicate black drum utilize both inshore and offshore environments for spawning, often in or near passes and channels.

Diel timing of spawning is thought to be near dusk based on drumming behavior and the developmental stages of eggs in ichthyoplankton samples (Mok and Gilmore 1983, Holt *et al.* 1985, Fitzhugh *et al.* 1987, Saucier and Baltz 1993). Generally, spawning occurs in early evening, one to two hours after sunset (Holt *et al.* 1985, Saucier and Baltz 1993), from November through May,

peaking in February and March according to these researchers. They found drum to spawn predominantly in shallow Gulf waters and the nearby passes, and channels between barrier islands. Spawning occurred during certain average physical conditions: water depth 9.2 m, salinity 18 to 27 parts per thousand (ppt), water temperature 20.8°C, current velocity 34.0 cm/s, dissolved oxygen (DO) 12.3 mg/l (Saucier and Baltz 1993). The spawning ritual if any, has not been documented. Saucier and Baltz (1993) noted peak spawning occurring at new and full moon phases when eggs would be transported seaward. Once sufficiently developed, larvae move inland and young continue their development inshore.

Fitzhugh *et al.* (1993) found a divergence in sex ratio for fish from commercial gears used in inshore versus offshore waters, primarily during reproductive periods, suggesting a segregation of sexes at that time.

While migrating, the black drum make a drumming sound which is audible from a boat (Pearson 1929). Thomas (1971) indicated that female drum are also capable of producing sounds. Chao (1976) reports that a drumming muscle is present in both males and females, however the females drum in a softer tone than males.

Saucier and Baltz (1993) found positive correlations of drumming fishes' school size and dissolved oxygen, temperature, and water velocity. Simmons and Breuer (1962) reported black drum schools occur where preferred food is abundant. It has further been noted that black drum form schools prior to spawning only to disperse after spawning (Silverman 1979). During reproductive periods the ratio of male to female drum increased offshore (Fitzhugh and Beckman 1987). Render and Parker (1987) found large black drum schools off the Louisiana coast from late summer through spring. However, decreased catches made by the northern Gulf purse seine fishery for black drum indicate that schools may disperse during the winter months and perhaps, move to near-shore spawning areas.

2.6 Age and Growth

Pearson (1929) and Simmons (1957) have reported lengths at age for black drum from Texas waters. Pearson (1929) used length-frequency analysis to report modal lengths of 250 mm (9.8 in.) and 370 mm (14.6 in.) at the end of the first two years. Other year classes could not be discerned due to overlap within year classes. Scales were used to age fish up to four years, after which calcification made them unreadable. Simmons (1957) reported lengths of 225 mm (8.9 in.) and 285 mm (11.2 in.) at the end of the first two years. Simmons and Breuer (1962) reported, based on tag recaptures, that black drum reached a length of 210-250 mm (8.3-9.8 in.) in one year, 290-330 mm (11.4-13.0 in.) in two years, and 400-430 mm (15.7-16.9 in.) in three years. Murphy and Taylor (1989) found an average growth rate of 100 mm per year for ages one to three, and 10-30 mm per year for fish 15 through 20 years.

Matlock *et al.* (1993) found the scale method for aging black drum up to four years is also valid and more cost effective than otolith ageing. Richards (1973) reported age and growth rates for black drum from Virginia waters using scales, time sequential sampling of juveniles, and computer extrapolation. Scales were reported as unreadable after approximately seven years of age. Richards' age estimation using black drum scales has not been validated. Using length-age and weight-age curves, Richards (1973) postulated maximum ages for black drum of 35 years or more. Matlock (1990) reported average maximum total lengths and age in Texas waters at 1000-1200 mm TL and 13 plus years, respectively. Murphy and Taylor (1989) estimated a maximum of 58 years based on otolith annuli from Florida's northeast coast.

Campana and Jones (1998) analyzed an ageing and validation method for black drum spawned from 1958 to 1965 using radiocarbon (C^{14}) levels. They found a maximum age of 42 years in a sample of adult Chesapeake Bay drum ($n=31$). Atmospheric atomic weapons testing during this period has manifested itself in drum otoliths as distinctive ratios of C^{14} . These levels are detected using accelerator mass spectroscopy assays and have shown that annulus based age assignments of these older fishes' otoliths are accurate within one to three years. They reported the only constraints of employing this procedure is the relatively high costs and that it is most sensitive on fish hatched during this period.

A standard length (SL) - total length (TL) relationship obtained for Louisiana black drum ranging from 44 to 1061 mm (1.7 to 41.8 in.) TL by Hein *et al.* (1980) was: $SL = 0.8331 TL - 8.6854$ ($n=749$, $r=0.999$). The length-weight (W) relationship computed was $Log W = 2.971 Log TL - 4.8176$ ($n=750$, $r=0.989$). Beckman *et al.* (1988) obtained a fork length (FL) - weight relationship for black drum from 180 to 1180 mm (7.1 to 46.5 in.) FL of: $Log W = 3.05 Log FL - 4.943$ ($n=2259$, $r^2=0.97$). Geaghan and Garson (in Leard *et al.* 1993) modified Beckman's log formula for converting FL to TL:

$$TL = 0.03743 * FL^{1.0265}$$

Von Bertalanffy growth models have been obtained for black drum tagged and recaptured from inshore Texas waters by Doerzbacher *et al.* (1988). Growth models were fit by excluding the coldest 120 days of the year, and growth parameters obtained were: $K = 0.219$ (SE = 0.027), and $L_{\infty} = 798$ (SE = 42) mm.

Beckman *et al.* (1988) validated age estimates for black drum from inshore and offshore Louisiana waters using otolith sections. Maximum age reported was 43 years. An initial rapid growth rate was observed for black drum until approximately four years of age (630 mm FL). Growth rate of older fish decreased, although, significant growth in length and weight continued to maximum ages sampled. The transition in growth occurred at an age which corresponded to age at maturity for black drum. Separate von Bertalanffy growth models were fit for each of these growth stages. Growth parameters for primarily immature fish were: $K = .0884$, $L_{\infty} = 1745$, $t_0 = -1.140$, and for primarily mature fish: $K = .0110$, $L_{\infty} = 1745$, $t_0 = -36.68$. Growth parameters for a single von Bertalanffy growth curve fit to all ages of black drum were: $K = 0.0540$, $t_0 =$

-12.6, and $L_{\infty}=988.8$, however, this model did not describe the growth of immature black drum very well (Beckman *et al.* 1990). It was noted that due to the extreme variability in age at given sizes, length or weight could not be used to accurately estimate age of mature fish.

Geaghan and Garson (1989, unpublished) developed a modification of the von Bertalanffy growth equation, a sloped asymptote model. Geaghan's modification consists of redefining L from a single constant to one which increases as a linear function of age:

$$L_{\infty} = B_0 + B_1 \cdot t$$

where B_0 and B_1 are the intercept and slope of the regression of L_{∞} on t . Substituting into the von Bertalanffy equation the model obtained is:

$$L_t = (B_0 + B_1 \cdot t) (1 - e^{-k(t-t_0)}).$$

The resulting equation, when fitted to data of Beckman *et al.* (1988, unpublished) provided an exceptionally good fit (Figure 5). Estimates of length at age based on this function are illustrated in Tables 2.1 and 2.2. The specific equation fit is of the form:

$$L_t = (610.0 + 9.959 \cdot t) (1 - e^{-0.6226(t-0.1229)}).$$

Geaghan and Garson (in Leard *et al.* 1993) preferred the Gompertz, sloped asymptote model:

$$L_t = L_0 e^{(b_0 + b_1)e^{-kt}}$$

due to a better fit to the data. Both of the sloped-asymptote models allow for continued growth of adult black drum with age, which is not done by conventional von Bertalanffy models.

Beckman (1989) reported age distributions for the harvested black drum population, noting ages ranging from one to 36 years, and unexplained dominant age classes occurring every four to five years.

2.7 Movements/Migrations

Larvae and small black drum tend to travel inland with incoming tides. Thomas and Smith (1973) noted that young drum entered a ditch accessible to them only on a flood tide. They hypothesized that the young were responding to higher temperatures and chemical clues from the marsh water flowing out of the ditch: "In earlier collections most young drum taken along the beach were near the outflow of the ditch, indicating a positive response to marsh water." Simmons and Breuer (1962) also noted that there is a temporary surge towards fresh water.

Thomas (1971) indicated that as the black drum grew, larger individuals would generally begin to move first.

Peters and McMichael (1990) noted 150 - 200 mm SL juvenile drum moved in the fall from shallow, muddy-bottomed areas of Tampa Bay into open waters of river mouths, bays, passes and nearshore Gulf.

Juvenile or adult black drum are present in Louisiana estuaries year-round, with an apparent increase in numbers inshore during May through July east of the Mississippi River according to commercial landings catch per effort data reported by Bane *et al.* (1985).

Fontenot and Rogillio (1970) recorded peak catch per effort from trammel net samples for the years 1960 through 1968 in the Biloxi Marsh Complex from April through August, with a lesser peak in December.

Inshore, commercial gill net fishermen in southeast Louisiana reported decreased fishing effort in late fall and winter for black drum due to migration of these fish from Lake Pontchartrain and Lake Borgne to offshore waters and an increase in availability of red drum (H. Pearce, pers. comm.). Through 1987 black drum landed during cooler months were primarily harvested by purse-seine vessels fishing in waters greater than three miles offshore (NMFS landing statistics). An aerial survey was conducted in 1987 to characterize distribution of red drum (Lohoefer *et al.* 1988). This survey also found large schools of black drum located offshore, often associated with cownose rays (*Rhinoptera bonasus*), either mixed with or following foraging schools, and to a lesser extent associated with red drum and crevalle jacks (*Caranx hippos*). The schools sighted ranged in (estimated) size from 5,000 - 100,000 pounds, with most schools estimated at 20,000 - 60,000 pounds (Ren Lohoefer pers. corr. 1989).

Though Rogillio (1982) reported a tagged black drum had traveled 103 km (64 miles) eastward, most stay in a general location for extended periods. Osburn and Matlock (1984) found that from a group of 68 drum tagged at one site, three were recaptured approximately two months afterwards, and three almost five months later. All were recaptured within 2 km (1.2 miles) of the tagging site.

According to Osburn and Matlock (1984) black drum are common throughout Texas bays. They noted substantial intrabay movements, suspected to be induced by the drum's constant search for sessile molluscan foods, and little interbay movements. From tagging studies utilizing fish 210-510 mm (8.3-20.0 in.) TL, they reported few fish returned to the bay tagging location from Gulf waters. Almost half of the tagged black drum (44%) recaptured moved more than 10 km (6.2 miles). Of the fish which left the bay where originally tagged, 75% were recaptured in adjacent bays. Recaptures in the Gulf of Mexico only accounted for 1% of all returns. Five of six returns in the Gulf had moved in excess of 30 km (18.6 miles) and two had moved great distances of 204 and 241 km (127 and 150 miles). Four of the six had been released within 15 km (9.3 miles) of a bay to Gulf pass.

Osburn and Matlock (1984) stated large black drum reside principally in Gulf waters. Cody, Rice, and Bryan (1985) caught drum 505-1000 mm (19.9-39.4 in.) TL in the Gulf of Mexico at depths from 5-37 m (16.4-121.4 ft) from October to April. They caught none in the summer but suggested that higher metabolic rates allowed the fish to escape the gear. Ross *et al.* (1983) captured black drum 221-991 mm (8.7-39.0 in.) TL each month of the year except July and October while working in Texas coastal waters. The black drum were found to a depth of 27 m (88.6 ft) from January through March, being less common from July through November.

Saucier and Baltz (1993) observed highest frequencies of large spawning aggregations of black drum in and near passes west of the Mississippi River from January through April. Their data indicated strong positive correlations with dissolved oxygen levels (> 9.6 mg per liter). They found correlations with temperature and current velocities; the range of several physical parameters were noted in which aggregations of various numbers gathered (see section 2.10).

Adults evidently enter bays from mid to late April and leave during early June, probably for spawning purposes (Thomas and Smith 1973). Richards (1973) reported that black drum school during the April-June spawning run and that they dispersed throughout Chesapeake Bay after spawning. Young-of-the-year could be caught in the fall during an apparent mass emigration, responding to a decrease in water temperature.

Adult black drum have been reported to school occasionally to feed where food is plentiful, and spawning schools have been noted. It was also noted that in 1953 most bivalves were destroyed in upper Laguna Madre causing a mass exodus of black drum (Simmons and Breuer 1962).

2.8 Pathology/Parasitology

The internal parasite most commonly found in large black drum is the larva of the tapeworm *Poecilancistrum* sp.. Though not harmful to humans (the adult stage occurs in the stomach of certain species of shark) the larvae are removed during processing as they are unappetizing and further reduce the marketability of large drum. Overstreet (1977) found *Poecilancistrum caryophyllum* and *Pseudogrillotia pleistacantha* in large black drum.

In certain samples of formalin fixed ovarian drum tissues, bacterial infections were found (Nieland and Wilson 1995). These were characterized as "...large (8-10 μ m), gram-positive rods." Initially, the report of this infection raised concerns that it could affect reproductive capacity of the affected fish. Since that first report, it has been concluded that these infections were artifacts of poor tissue preservation based on evidence such as: the site of infection was primarily in the central core of the ovaries, incidence of infection was proportional to ovary mass, and when strict preservation techniques were adhered to the incidence of infection was drastically reduced.

Silverman (1979) reported that, "Ectoparasites are fairly common on black drum. They include the copepods: *Caligus repax* Milne Edwards, *C. bonito* Wilson, *C. latifrons* Wilson, *C. pelamydis* Kroyder, and *C. haemulonis* Wilson. The isopod *Nirocila acuminata* Schioedte and Neinert was taken from black drum by Bere (1936) and Simmons and Breuer (1962); and Thomas (1971) found *Livonica ovalis* on fish collected in Delaware. They probably are the cause of damage to the gill filaments and gill covers of some fish."

Henderson-Arzapalo *et al.* (1994) reported mild infestations of the branchiuran parasite *Argulus* sp. on eight inch, pond raised black drum, and further noted heavier infestations on black drum x red drum hybrids.

2.9 Food Habits/Trophic Relations

Black drum feed during daylight hours and at night, but feeding is less intensive in early morning hours (Thomas 1971). While feeding, black drum occasionally dredge the bottom, creating turbid plumes in the water column which are often easily visible from the air, enabling spotter planes to locate large schools. In shallow waters their fins are often visible above the surface, "headstanding" or "flagging" while feeding (Pearson 1929, Darnell 1958, Dugas 1986).

Studies of black drum nutrition have indicated that its diet varies depending on the age and size of the individual. Dugas (1986) reported results from a stomach analysis of black drum in and near Barataria Bay, Louisiana. Using five size class divisions, he found that for juveniles less than 100 mm (3.9 in.) TL, 36.9% of the stomachs contained arthropods with about half of these crustaceans and half insects. Mollusks composed 17.9%, all of which were pelecypods. Dwarf surf clams, *Mulinia lateralis*, were found in 9.5% of the stomachs, and 1.2% contained the oyster, *Crassostrea virginica*. Annelids were observed in 15.5% of stomachs divided almost evenly between oligochaetes and polychaetes. Only 11.9% of the stomachs contained fish.

In fish of 201-300 mm (7.9-11.8 in.), 50% of the stomachs contained arthropods, most of which were crustaceans. Mollusks were found in 22.2% of the stomachs, all of which were pelecypods. *M. lateralis*, *Donax variabilis*, and *Amygdalum sagittatum* each comprised 5.6% of the total number. Annelids were recorded in 27.8% of the examined stomachs, with most being polychaetes; 19.4% contained fish.

In the 301-400 mm (11.9-15.7 in.) TL drum, 68% of stomachs contained arthropods, mostly crustacea. Mollusks were found in 45.5% of the stomachs, significantly more than the size classes of less than 300 mm TL. Also significant is the 4.5% of stomachs that contained oysters. *M. lateralis* increased to 9.1% and only 4.5% contained annelids, all of which were polychaetes. Fish were in 31.8% of the stomachs.

In the greater than 400 mm (15.7 in.) TL size class, 46.7% of the stomachs contained arthropods, predominantly crustacea. There was a four fold increase (to 16.7%) in the frequency

of oysters found in stomachs, and *Mulinia* sp. remained about the same at 10.0%. Annelids (all polychaetes) and fish comprised 10% and 26.7% of stomach contents, respectively.

Generally, arthropods were dominant in all size groups except those larger than the 400 mm size class, where an equal number of mollusks were found. The frequency of mollusks increased throughout the fishes' size range. Pearson (1929) found a similar increase, and a decrease in the frequency of crustaceans with a steady rise in mollusk percentages for black drum 80-990 mm TL. Arthropods in small black drum stomachs were relatively small and soft bodied. In fish less than 100 mm (3.9 in.), insects (Family Corixidae: the water boatmen) almost equaled the frequency of crustaceans. The frequency of shrimp and large crabs (portunids) increased with increasing fish size.

Mulinia lateralis occurred at about the same percentage in all size groups of fish. This clam is very common in all black drum habitats except the beach where it is replaced by *Donax variabilis* (Dugas 1986). Pearson (1929) and Breuer (1957) found that black drum ate mostly *Mulinia* sp. along the Texas coast.

Darnell (1958) found that 65% of black drum stomachs contained mollusks, predominantly the clam *Rangia cuneata* in Lake Pontchartrain, Louisiana. The mud crab *Rithropanopeus harrisii* made up 12% of the black drum stomach contents. Other field observations, coupled with the stomach content data led Darnell (1958) to conclude that *R. cuneata* is the staple food of black drum greater than 100 mm TL in Lake Pontchartrain. Darnell (1958) also reported that he had indirect evidence, from field observations of shell fragments in the buccal cavity, that black drum were capable of eating larger hard shelled mollusks. Pearson (1929) correlated food with the environment in which the fish feeds, noting that black drum are most abundant in shallow muddy lagoons where pelecypods (specifically *Mulinia*) are common.

Dugas (1986) observed oysters as the dominant mollusk in the stomachs of 700-900 mm (27.6-35.4 in.) size fish caught in an area heavily used for oyster culture. However, only two smaller fish contained oyster shells, and these were believed to be ingested incidently while feeding. Simmons and Breuer (1962) found the mussel *Brachiodontes exustus* and no oysters in the stomachs of drum observed feeding on or near oyster reefs in Baffin Bay and Laguna Madre, Texas.

Annelids, predominantly polychaetes, were the most common in the smallest three size groups of fish. Pearson (1929) also found a high incidence of polychaetes in black drum 80-200 mm (3.1-7.9 in.).

Dugas (1986) concluded from his study and other data that black drum are opportunistic feeders. The diversity of food types found are illustrated as follows: Gunter (1945), Copano and Aransas Bays, Texas - crustaceans (amphipods and blue crabs); Pearson (1929), Corpus Christi, and Breuer (1957), Baffin Bay and Laguna Madre - *M. lateralis*; Kemp (1949) and Miles (1949), Aransas Bay, Texas - shrimp; Darnell (1958), Lake Pontchartrain, Louisiana - *Rangia cuneata*;

Fontenot and Rogillio (1970), Biloxi Marsh, Louisiana - *R. cuneata*, oysters, and crustaceans; Overstreet and Heard (1982), Mississippi Sound - hooked mussel (*Ischadium recurvum*).

Dugas (1986) concluded that the differences in feeding habits between his study and others were due to: 1) spatial and temporal distribution of prey species, and 2) size of black drum examined. Captured 400-600 mm (15.7-23.6 in.) TL drum were observed eating 25-50 mm oysters and smaller black drum were believed to eat soft-bodied insects and polychaetes, fish, and fragile shelled mollusks such as *Mulinia* sp. Cave (1978) reported that adult black drum up to 900 mm (35.4 in.) TL ate oysters 25-75 mm and larger drum ate oysters from 25-115mm.

Part of the reason for changes in diet from smaller to larger size black drum is the development of pharyngeal teeth and associated musculature which allows larger fish to crush heavy shells of oysters and other strong shelled mollusks (Figure 6). According to Cave (1978) the ability of the drum to fit the oyster within the pharyngeal teeth is the limiting factor to what size they will consume. Additionally he found that drum greater than 300 mm can consume an average of one oyster per pound of body weight per day.

Cate and Evans (1994) found evidence that, with minimal population estimates, black drum from Texas waters are responsible for processing in excess of one million kg of shell material annually (including gastropods and bivalves). They were unable to find any characteristic abrasions, dissolution, or markings on shell material due to drum predation/digestion, and noted a lack of any alteration other than fragmentation. It was also noted that though transport of shell material by such a mobile molluscan predator would be expected, very little evidence of this could be found. Most drum stomachs contained only materials found at the locations where they were captured.

Oyster fishermen have long reported black drum predation on oysters and have employed several methods to prevent this, such as: hanging dead drum from poles on the reef, setting gill nets, building fences to prevent entry, beating the water with poles, and using gas hazing cannon to scare the drum. These efforts have met with limited success. The small seed oysters, single oysters, and oysters which have been stressed are noted to be most susceptible to drum predation.

Adult black drum have very few competitors in other fish but must compete with the oyster drill (*Thais haemostoma*) and other molluscan predators for their principal food source. While not much information on the black drum's competitor/predator relationship exists, they are known to feed on smaller fish, crabs, and shrimp and they compete with other organisms that do the same. As adults their principal food source is mollusks, therefore they have few competitors in other fishes.

Once they reach maturity, they have no known predators other than man. As juveniles and larvae they may fall prey to any number and variety of predators. Various authors (Cowan *et al.*

1992, Saucier and Baltz 1993) give evidence that ctenophore and various hydromedusae predation can be a significant factor in egg and early larval drum survival.

2.10 Habitat Requirements

Pearson (1929) indicated that most of the black drum population along the Texas coast was in small shallow, muddy bays such as Oso and Nueces Bays. Fox and Mock (1968) collected black drum from Barataria Bay in shallow, turbid water having shore vegetation (*Spartina*) to the water's edge with shell reefs on a fine silt bottom. Black drum have been taken at offshore depths of 48.8 m (160 ft), but not at 100 m (328 ft) (Ross *et al.* 1983). This may indicate a preference for shallower waters, although gear avoidance may have precluded capture at depth.

Spawning areas, in deeper water offshore, or in bays and channels are occupied in late fall and winter with 90% of the spawning occurring in February and March (Simmons and Breuer 1962, Beckman *et al.* 1988, Parker *et al.* 1988, Fitzhugh and Beckman 1987). According to Beckman *et al.* (1988) black drum evidently do not enter into the offshore spawning population until maturity (4-6 years of age). Because this age group was essentially missing from collection efforts throughout the Gulf region, Ramsey and Wakeman (1989) suggest that fish in this age group may either inhabit unsampled habitats or be dispersed prior to entering the offshore spawning population (and not recruited to the sampling gear).

Black drum are most abundant in shallow muddy lagoons where pelecypods are abundant (Pearson 1929). Simmons and Breuer (1962) intimated that movement and location of black drum in Texas bays was determined mostly by adverse conditions (lack of food) and that when food was abundant there was little intra- or inter-bay movement. However, Thompson and Fitzhugh (1985) noted that prior to 1981 the black drum landings "peaks and valleys" coincided with high and low salinities.

In the Delaware Bay region small individuals enter the upper estuaries in early June and congregate in still waters of creeks and ditches. In late June, when about 30-50 mm (1.2-2.0 in.), they begin moving out of these shallow areas, and by August young are evenly distributed in the river systems. They start entering the bays by early September (Thomas and Smith 1973).

Juvenile black drum are usually located in areas of low current velocity or little tidal influence, such as creeks, ditches, channels, stagnant sloughs, and boat basins. They prefer nutrient rich marsh situations near muddy bottoms and occasionally near sand and gravel bottoms (Thomas 1971, Richards 1973, Peters and McMichael 1990). Thomas and Smith (1973) found young black drum in salinities of 0-28 ppt, but suggested that factors such as bottom type, current, and temperature are more critical in determining habitat of the young than salinity.

Slightly larger black drum are found in open waters, bays, and lagoons. They prefer habitats such as Laguna Madre and Baffin Bay which are utilized by all year classes of black drum (Simmons and Breuer 1962).

The most common species captured with young drum (less than 50 mm) in the marshes of the Delaware River system (salinity 0-6 ppt) were *Fundulus heteroclitus* and *Morone americana* (Thomas and Smith 1973). According to Frisbie (1961) fishes associated with juvenile black drum, greater than 100 mm in the Chesapeake Bay area, were a few euryhaline freshwater forms and the rest were euryhaline estuarine species, including: *Ictalurus nebulosus*, *Notropis hudsonius amarus*, *Lepomis* sp., *Morone americana*, *Morone saxatilis*, *Anchoa mitchilli*, *Menidia beryllina*, *Apeltes quadracus*, *Cyprinodon variegatus*, *Fundulus heteroclitus*, and *Gobiosoma* sp.

From LDWF bag seine samples of drum from 73 to 390 mm (taken 1985 through 1990) the most commonly associated species in order of relative occurrence were: *Brevoortia patronus*, *Anchoa mitchilli*, *Micropogonias undulatus*, *Sphoeroides parvus*, *Menidia beryllina*, *Arius felis*, *Leiostomus xanthurus*, *Cynoscion arenarius*, *Mugil cephalus*, *Membras martinica*, *Cynoscion nebulosus*, *Citharichthys spilopterus*, *Lagodon rhomboides*, and *Fundulus grandis*.

Adults, as previously noted, are often associated offshore with cownose rays, crevalle jacks, red drum, and pompano (Lohoefer, pers. comm.).

2.11 Environmental Tolerances

Black drum are often found in hypersaline waters but are considered euryhaline because they can quickly adapt to a wide range of salinities (Simmons and Breuer 1962). LDWF fishery independent net samples (1985 through 1990) found juvenile drum in inshore waters at salinities ranging from 0.0 to 35.9 ppt, and temperatures from 7 to 38°C.

Adults have been taken from areas that exhibit a broad range of physicochemical traits. Barrett *et al.* (1978) collected black drum 160-870 mm (6.3-34.3 in.) TL from the Timbalier Island area and offshore with ranges of salinity at 0.7-20.7 ppt, temperature at 8.6-31.5 °C (47.5-88.7 °F), and dissolved oxygen at 5.2-11.8 mg/l. Samples (1978 through 1989) associated with LDWF's Louisiana Offshore Oil Port (LOOP) monitoring program found juveniles in salinities from 0.8 to 33.8 ppt, and adults at 21.1 to 36.7 ppt.

In developing spawning suitability indices, Saucier and Baltz (1993) found several positive correlations of physical conditions and spawning aggregations of drum: dissolved oxygen (DO) from 9.6 to 13.8 mg/l (= parts per million) (no drumming was observed below 9.6 mg/l); salinities from 10.0 to 27.0 ppt (no drumming was observed below 10 ppt); temperatures from 15.0 to 24.0°C (no drumming was observed below 15 or above 24°C); current velocities from 2.0 to 70.0 cm/sec (the velocity suitability increased as current velocity increased); and, water depth ranges from 1.2 to 48.8 m (most observations occurred from 4 to 10 m).

Black drum have been found in salinities ranging from 0 to 80 ppt. Many adults found in salinities of 80 ppt had glazed eyes, or were blinded, and some had lesions on their bodies (Simmons and Breuer 1962). Simmons and Breuer (1962) noted that adults are commonly found in ranges of 25-50 ppt. Gunter (1945) caught black drum of various sizes in Texas bays in salinity ranges of 2.6 to 34.9 ppt and found them to be most abundant between 10.0 to 15.0 ppt. In coastal Louisiana, from April 1968 through March 1969, black drum were caught from salinities of 0.2 to 24.9 ppt; the size range of these fish was 45-370 mm (Perret *et al.* 1971).

Fontenot and Rogillio (1970) reported no correlation of salinities to sampling success but peak catches were observed in salinities of 15 to 20 ppt. Rogillio (1975) noted that they had little effect on black drum, and Frisbie (1961) found no evident correlation between size of fish and salinity. Black drum have been observed in water temperatures ranging from 3 to 35 °C (37.4-95.0 °F).

Frisbie (1961) reported an observation by T. H. Bean (1902) that a low water temperature of 3.3 °C (37.9 °F) killed young black drum in captivity. Simmons and Breuer (1962) reported a freeze in 1951 killed more black drum than trout and red drum, but the black drum populations apparently recovered much more rapidly. They also observed that after a sudden decrease in water temperature (to 3.0 °C in Laguna Madre) black drum moved to deeper water. However, according to Pearson (1929), black drum are extremely hesitant to move from shallow intercoastal waters of Texas; as a result, drastic decreases in water temperature often result in great mortalities.

After the passage of Hurricane Andrew in August, 1992 about 27,000 (mainly adult) black drum were found dead in the path of the hurricane, on Point au Fer Island, Louisiana. They were part of a multi-species kill that involved an estimated 9.4 million fish, mainly Gulf menhaden, Atlantic croaker, and striped mullet. The cause of this kill was never specifically identified, but the location implied some association with the passage of the storm, perhaps interacting with hypoxic offshore waters (LDWF, unpublished 1992).

Black drum are not adversely affected by turbid waters, though Rogillio (1975) noted larger catches in lower turbidities. Simmons and Breuer (1962) observed black drum apparently thriving in turbid water only four inches deep where the temperature was 35 °C (95.0 °F).

Thomas (1971) caught black drum while oxygen was 3.4 parts per million, temperature 35.2 °C (95.4 °F), and salinity 25 ppt. He also noted oxygen ranging from 4.5 to 10.5 ppm with temperatures 21.5-28.5 °C (70.7-83.3 °F), and salinities 0-6 ppt, where he caught several young black drum (mean lengths 10.1-36.8 mm TL).

3.0 DESCRIPTION OF THE FISHERY

3.1 History of Exploitation

Harvest of black drum by native Americans was inferred from the collection of otoliths in a midden deposit near Corpus Christi Bay, Texas (Ricklis 1988, cited in Noguera 1991). This site was characterized as a long-term, recurrently occupied fishing camp. Analysis of otolith increments by Noguera (1991) suggested that black drum harvest occurred year-round, with most fishing success taking place during the summer-fall season, especially the early summer. Black drum from 1-12 years old were represented in the otoliths from the midden, accounting for 100 of the 212 otoliths collected from the site (Noguera 1991).

There is little documentation of the earliest recreational activities directed toward black drum. Pearson (1929) in describing the drum's affinity for shallow waters stated, "It has been said that in past years farmers were accustomed to chase the large 10 to 40 pound drum over the shallow mud flats with pitchforks, such chase, of course, furnishing a considerable amount of thrill as well as fish."

Historical information and recent creel census show that black drum are not a primary target species among recreational fishermen. This is evident in the NMFS, MRFSS records listing the stated target species of groups of recreational anglers in the Gulf of Mexico covering all modes (Table 3.1).

Black drum have been sold commercially for at least 100 years. A U.S. Bureau of Fisheries report on Texas fisheries indicates landings of 50,400 pounds of black drum in 1897 and indicates that commercial landings records for drum predated this by stating that drum landings had risen from "...almost nothing in 1889 to second place in 1923" (Higgins and Lord 1926). The earliest records encountered for the Gulf states are a compilation of records dating from 1908, 1917 and 1919 by Welsh and Breder (1923) combining catches of Gulf and Atlantic states for red drum and black drum. These data indicate a total landing of 7,231,778 pounds with a dockside value of 280,484 dollars, an average of 3.9 cents per pound. Though there were some number of black drum landed during the 1800's, the Louisiana black drum fishery existed largely as by-catch and secondary to the red drum segment of the industry. Even through the early 1970's, most fishermen would only target black drum when red drum were not available. In addition, only small and medium black drum were of any historical commercial value, the large fish's flesh being too coarse and often carrying parasites (Russell, unpublished ms 1989).

The first commercial records of black drum in Louisiana are from 1923, with Pearson (1929) reporting 60,000 pounds having a value of 2,000 dollars or 3.3 cents per pound. By 1929 Fiedler (1930) reported 266,367 pounds valued at 15,565 dollars or 5.8 cents per pound caught by fishermen using haul seines, trammel nets and trot- or hand-lines (Table 3.2).

3.1.1 Economics

Black Drum are economically important to the State of Louisiana and its residents as well as other Gulf Coast States. They provide income directly and indirectly from commercial and recreational activities. Historically in both fisheries the economics were largely interwoven with activities targeting other fish species, notably as bycatch of the red drum and spotted seatrout fisheries. Louisiana commercial fishermen no longer target red drum (gamefish status) and spotted seatrout are harvested only by commercial rod & reel gear, under a season and quota. Therefore only small amounts of black drum are presently harvested as by-catch of those fisheries. As a result a larger percentage of commercial fin-fishermen than recreational fin-fisherman target black drum.

Due to the lack of specific economic and market data relative to Louisiana's estuarine fisheries, specifically black drum, direct comparisons of commercial and recreational fisheries economics can not be made. There are also differences in the methods of assigning value to recreational and commercial fisheries that preclude comparisons of their dollar values.

Recreational values are usually reported as dollars from the retail level and dollars spent are considered as disposable income that may be redirected into other leisure activities. Commercial values are usually placed on the catch as dockside value which represent dollars to the fishermen at the producer level.

The actual economic value of these respective fisheries must include additional dollars of value added through further tangible and less tangible considerations. Some of these additional value adding steps are processing, packaging and shipping of commercial catches, increasing values of goods to the ultimate consumer or user from the manufacturer to wholesaler and retailer levels, and the value placed by the individual on the enjoyment of the recreational, commercial, consumptive and non consumptive activity. Attempts to quantify these additional values beyond the market price or actual expenditures are made by using willingness-to-pay estimates.

3.2 Commercial Fishery

The black drum fishery in Louisiana can be separated into small drum, and adult or "bull drum" (>27 inches), components. Inshore fisheries can be subdivided into fisheries targeting three distinct size groups of the black drum: generally, 2 - 5 lbs. (small or "puppy"), 6 - 10 lbs.(medium), and 10 plus lbs. (large or "bull"). These fish are sized and sold in different value groups with both intrastate and interstate markets. The inshore fishery generally operates coastwide and targets all marketable size drum. In the adult fishery, which had operated largely east of the Mississippi River, 90% plus of the catch consisted of large drum targeted during the spring and summer months by haul seines and strike-gill nets. Significant numbers of large drum had also been caught offshore, during winter months, by trawlers.

3.2.1 Description of Fishing Activities

In Louisiana and adjacent waters a number of different methods have been used to capture black drum commercially: gill nets, otter trawls, haul seines, trammel nets, trot-lines, hand-lines, and purse seines.

Until excluded by legislation, gill nets were the primary method of black drum capture (Table 3.3) and were generally used inshore. Gill nets are of two major types: "strike-nets" and "set-nets". Strike-nets have been used to target "bull" drum, by deploying the net to surround large schools, sometimes overlapping nets of other fishermen to a total length of 10,800 feet (Russell *et al.* 1986). When the net is used in this fashion it's capture range is not as size selective. In the past, such strike-nets had sometimes been directed by spotter plane. Strike fishing was also practiced when targeting smaller "puppy" drum. Typically, these operations are single vessel operations, using nets up to 1,200 feet long, operating in both open-water areas and smaller lakes and bays. When properly used by experienced fishermen this method can be the most selective of any commercial finfish gear.

The set-net, another common method of deploying gill nets or other entangling net gear, had been employed by staking several nets, usually between 200-300 feet long, out from the shoreline. Fishermen also submerged large lengths of net anchored out over night away from shore. 1984 legislation prohibited the use of unattended nets. Set-nets are the most size-selective gear available. Various mesh sized gill nets have been used year round to catch different size drum. Osburn and Matlock (1984) reported stretched mesh sizes and corresponding average lengths (TL) of black drum captured: 3"- 250 mm (9.8 in.); 4"- 330 mm (13.0 in.); 5"- 415 mm (16.3 in.); 6"- 490 mm (19.3 in.); and nets with meshes 6" to 7" caught black drum 445-545 mm (17.5-21.5 in.). Fitzhugh and Beckman (1987) noted that 6" stretched mesh is most commonly used, but as large black drum become more marketable, fishermen shift to larger mesh, up to 9", and catch fish 600-950 mm (23.6-37.4 in.).

Vessels used to employ gill nets are of a wide range in type and capacity; from one man skiffs of lengths less than 20 feet which can transport a few hundred pounds to large hulls exceeding 40 feet and transporting over 15,000 pounds. The average vessel approaches 30 feet in length, the smaller vessels are generally used for set-nets. Some operations used large ice/slush boats which were capable of transporting thousands of pounds of drum.

The otter trawl, a gear generally used for shrimping, is now one of the primary gears used to target black drum. When used to target fish, trawls are typically made of larger mesh webbing than when used for shrimping, to reduce drag of the gear in the water. This gear accounted for greater than 60 percent of the 1997-1998 bull drum landings. This gear has been responsible for a large percentage of bull drum landed in winter months, particularly west of the Mississippi River, in years when shrimping was poor. East of the River, trawlers have landed drum mostly from June through December. In addition, large black drum had been caught as shrimp bycatch, though numbers have been significantly reduced with the use of TED's. Fitzhugh and Beckman

(1987) observed a high size selectivity for large drum with this gear, catching black drum in a range from 422-960 mm (average 29 inches) which could be due to the offshore fishing locations. Trawl vessels used in catching black drum are generally large offshore boats from 30 to 70 feet long, capable of towing several trawls and transporting in excess of 100,000 pounds of black drum.

Haul seines were often used inshore and in near shore waters, to surround schools of large drum, and are most efficiently used in conjunction with spotter planes. This gear was responsible for a majority of the Louisiana landings of bull drum from the late 80's up to the restrictions on entanglement nets. They were the most efficient gear type for catching large numbers of drum inshore as it does not require the time consuming process of removing tangled fish, one at a time, from the net. Haul seines, however, are capable of capturing any marketable size black drum due to their relatively small mesh size. This gear was not usually used in summer months west of the Mississippi River. The fishermen using this gear, in addition to their net boats have often employed ice-slush transport boats or barges capable of transporting to 150,000 pounds. These barges often collect fish from several vessels to transport them to a dock. Currently this gear is used only in federal waters.

Trammel nets were an inshore gear consisting of three layers of net panels grouped together in a sandwich-like fashion. The inner panel being smaller, the outer panels are large enough to allow the inner to be pushed through it causing a pocketing effect or tangling individual fish. Trammel nets have not generally been used in summer months. Vessels using this gear were of small to moderate capacities, usually from 20-30 feet in length.

Purse seines were once a prominent gear in the offshore commercial fishery (Table 3.3). Purse seine permits for use in Louisiana waters were not available after 1986 (except for herring-like species). Though purse seines were allowed in Louisiana waters through most of 1981, this gear was not exploited by Louisiana fishermen largely because the large "bull" drum had no local markets at the time. They have since declined in popularity due to the EEZ red drum closure, the fluctuating market for bull drum, and the fact that Louisiana special permits for restricted inshore use of this gear are no longer available. Purse seines are used offshore to surround large numbers of fish. A purse-line in the bottom of the net is tightened in a draw string fashion giving the net a bowl shape from which the captured drum are scooped out with large dip nets. When purse seines were no longer a legal gear in state waters, strike gill nets and haul seines became more popular. The vessels which operated purse seines targeting drum were large, ranging upwards from 40 to 90 feet. These vessels could catch and transport in excess of 80,000 pounds of drum per trip and some up to 300,000 pounds. These vessels had crews from three to seven people and also used smaller boats to assist in setting the net and in maintaining the position of the larger vessel.

Hand-lines, longlines, and trotlines have been used sporadically in Louisiana's black drum fishery, though they have historically been used as a primary gear in Texas (Leard *et al.* 1993).

This gear category accounted for approximately 21 percent of the bull drum landings of the 1997-1998 season.

Trotlines consist of a common horizontal line anchored at the ends at the desired fishing location, with hooks hung along its length at various depths. While attempting to mimic the Texas commercial trotline fishery that was targeting primarily black drum, McEachron *et al.* (1988) set hooks near the surface and bottom in the upper and lower Laguna Madre. Of the total fish caught (4,324), black drum represented the third most common species (7.7%), red drum the second (23.4%), and sea catfish the most common (60.8%), during their 1985 study. They demonstrated that incidental catch of red drum can be reduced by positioning trotline baits on the water bottom: the average number per line hour decreased from 0.209 nearer the surface to 0.047 on the bottom.

Hand-lines are not staked out as trotlines are, but also result in a very broad range of capture sizes. These gear when used in targeting black drum are most often used from small boats with limited capacities and one or two men crews.

The number of gill net licenses issued indicates a maximum number of fishermen using this gear; however, this does not directly indicate the number of fishermen targeting black drum, as many land drum incidentally as by-catch, and on a seasonal basis using various gear (Figure 7). According to Pearce *et al.* (unpublished ms 1989), there were approximately 350 commercial fishermen statewide who targeted black drum.

In 1989, quotas paired with size limits were established, requiring adult or "bull" drum be caught only by permit in the commercial fishery. The average number of fishermen issued permits to catch black drum >27 inches 1990/91 to 1996/97 has been 120 (range: 85 to 165). The 1997/98 permittees total 109.

In 1992 the licensing regulations were changed so that salt water gill nets were licensed separately allowing any number of salt water gill nets to be used per licensee.

With Act 1316 of the 1995 legislative session, entanglement nets (gill nets, seines, and trammel nets) were banned in salt waters of Louisiana. Special gear permits and licenses established in this act allowed for limited use of these gear for catching black drum seasonally, until March 1, 1997. Commercial fishing under these restrictions was not allowed at night or on weekends. In Louisiana waters, as of this writing, it is no longer legal to harvest black drum with an entanglement net of any type in saltwater areas of the state.

A commercial rod and reel license, that was also created by Act 1316, may be used in order to catch black drum. This license, like the aforementioned permits, can only be obtained after certain strict criteria are met. Specifics can be obtained through the LDWF Commercial License Section, LDWF Enforcement Division, or LDWF Marine Fisheries Division.

3.2.2 Effort and Harvest

The commercial black drum landings in the Gulf of Mexico fishery have fluctuated from approximately 1 to 2 million pounds per year from 1923 to 1978, averaging 1.7 million pounds. A low of 729,000 lbs. occurred in 1940, and the high for that period was 2,821,000 in 1978. Landings have increased steadily from that point to 1988 totals of approximately 10.5 million pounds. While most Gulf States' black drum landings have remained relatively stable, those of Louisiana and Mississippi had greatly increased through the '80s then declined again to a Gulf low of 2.1 million pounds in 1991 (Figure 8).

Historical landings of black drum in Louisiana, which were relatively low through the 1950's, began to increase through the 1960's possibly due to the introduction of the monofilament gill net (Russell, unpublished ms. 1989) (Table 3.2, Figure 8). The majority of landings through the 1970's occurred in central Louisiana coastal parishes west of the Mississippi River. Figure 9 illustrates Louisiana's geographical commercial landings trends from eastern and western areas from years 1989-1997. In the late 1970's, the drum fisheries began a more rapid expansion due to greater public demand for fishery products, a corresponding increase in dockside price, and an increase in local processing ability. As the fish became more popular in the 1980's there were concurrent landings increases further westward. The market for the large drums developed during late 1980 when fishermen landed large amounts of black drum taken incidental to other fishing operations. Non-resident purse seiners had discovered a market in Africa for the product and began to take advantage of this opportunity. Soon New Orleans area seafood dealers followed suit (Leard *et al.* 1993, Russell unpublished ms. 1989). East of the Mississippi River landings increased dramatically as regional fish dealers developed red and black drum markets which included the bull drums for the first time.

Before the EEZ red drum closure and Louisiana's commercial moratorium on red drum in 1987 black drum had been sold in lower volumes than the more preferred red drum. The rise in popularity of red drum through the 1980's created a demand that was met, in part, by using very large red drum processed as filets. These same markets would occasionally use black drum, a cheaper but slightly less popular substitute. However, once the moratorium was in place the market shifted largely to black drum. At first only conventional commercial gear was used to capture fish to accommodate this market. Fishermen then found that they could use spotter planes to easily locate very large schools of bull drum which could subsequently be captured with haul seines or modified gill nets. Larger vessels using haul seines and carrying an ice slush could catch and/or transport large amounts of black drum providing a fresher product essentially on the fish dealer's demand. Unfortunately fishermen also discovered that occasional large landings or groups of large landings of drum were capable of flooding the market and depressing prices. Operators of smaller vessels claimed they were being driven out of the fishery. This was amplified by more large vessel fishermen and new dealers attempting to enter the drum markets. Spotter planes were subsequently restricted to use in the menhaden industry; this regulation met with only limited success at restoring the more historical fishery.

Louisiana accounted for 8.8 million pounds of the record 1988 Gulf landings of 10.5 million pounds (Tables 3.2 & 3.3). Landings figures have since fluctuated: declining from 1989 to 1991 (1.9 million pounds), then increased to 1994 (3.7 million pounds), and declined again to 1996 landings (approx. 1.6 million pounds, the lowest figure since the 1970's). Possible causes were suggested: 1) less fishing incentive in EEZ (in conjunction with the red drum moratorium); 2) fishermen were redirecting efforts to other species such as mullet and sheepshead; 3) "softer" markets driving down prices for small drum, and demand for bull drum declining as the red drum were no longer available (Harlon Pearce pers. comm. 1989); 4) overfishing in certain geographic areas (Russell *et al.* 1987) and 5) regulatory changes. The percent component of bull drum in these landings figures has also fluctuated, decreasing from 60% in the 1990/91 season to 24% in the 1993/94 but then upward again to 47% of the 1995/96 season landings, then plummeted to 16% during the 1996/97 season and up again to approximately 35% for 1997/98 (Figure 10). Some of this latest trend may be due to market adjustments and fishing effort shifts based on regulation changes.

3.2.3 Mariculture

Aquaculture does not seem economically practical at this time due to the black drum's availability to the commercial fishermen and the focus on red drum. Richards (1973) noted the black drum's adaptability to a wide range of situations, its quick growth and the high value of fish 1-5 pounds. This may warrant further investigation by interested parties.

Marcello and Strawn (1972) experimented with cage culture of small marine fishes including black drum. Two drum were maintained in cages for 233 days in the intake canal of a steam-electric generating station in Galveston Bay, Texas. The feed used was Purina trout chow (40% protein) with a pellet size of 7 mm x 5 mm. The amount of supplemental food was 3% or 5% of total weight in a cage. Both percentages were used at different times. The fish were fed once daily, 6 days per week. Toward the end of the experiment, after the December 1971 growth sampling, the black drum did not receive supplemental feed. The average length and weight increased about 78 mm and 436 g and the relative growth in average weight was 186.3%.

Keney and Zein-Eldin (1986), and Henderson-Arzapalo *et al.* (1994) indicated that drum could be suitable for mariculture. Henderson-Arzapalo *et al.* (1994) in a 1984 mariculture trial artificially crossed a black drum female (BD♀) x red drum male (RD♂), and a RD♀ x BD♂ to achieve a fertilization rate of 79.2% and 0% respectively. Black drum, red drum, and hybrids were all simultaneously cultured for 9 months in order to make comparisons. The hybrid was found to have similar flavor, and the faster growth rate of the three groups (3,000 fingerlings grown out over 230 days). Averages at harvest of weight, length, and production for each group were, hybrid: 190 g, 245 mm, and 10.7 kg/ha/day; black drum: 144 g, 214 mm, 10.6 kg/ha/d; and red drum: 142 g, 236 mm, 7.0 kg/ha/d. Black drum had higher survival rates (94 to 72%) than the hybrid but a lower mean food conversion rate. External parasites were more of a problem on the hybrids; they noted a susceptibility to parasitic copepods and *Argulus* sp..

3.2.4 Economics of Commercial Fishing

An economic analysis of a commercial fishery will involve dockside values. However, using only dockside values will not measure the total benefit of the fishery to society. Commercial fishermen may accept lower financial returns and more uncertain benefits to remain within their occupation. There may be other non-monetary values the fisherman receives, such as more freedom, the aesthetic setting, wildlife seen while fishing, etc. Dockside values will not completely capture this value.

The total benefit to consumers of black drum is greater than a dockside price. Total benefits to consumers include the dockside price, any value added, and the willingness of some consumers to pay more than the market price. Value added is any processing or preparation of the fish. Some consumers would be willing to pay more for black drum than the market price because they derive more satisfaction from its consumption. The total benefits to the Louisiana economy would include all these items.

Information on annual landings, dockside values, prices and regional share of a fishery are useful in trend analysis and serves as an indicator of how a particular fishery is performing. Economic data associated with Louisiana's commercial landings of black drum for the 1970-95 period is contained in Table 3.4.

Commercial landings (harvest) of black drum in Louisiana increased from 434 thousand pounds in 1970 to over 2.9 million pounds in 1995. In 1988, the largest recorded annual Louisiana black drum harvest was over 8.7 million pounds.

Much of the initial increase in Louisiana's black drum landings during the 1970 to 1994 period occurred in the 1980's and was linked to the increased popularity of red drum (S. Russell unpublished data 1989). Black drum was considered an excellent substitute for red drum and was touted for its similarity in taste and texture to red drum. Other factors which may have attributed to changes in the historical landings of black drum include: changes in dockside prices, the reduced abundance and/or increased regulations on other species; changing laws and regulations (such as gear restrictions); the introduction of new harvest technologies; expanding markets of other species; and changes in consumer attitudes and the substitutability of black drum for other species.

Louisiana's share of the Gulf of Mexico commercial black drum landings also increased from 32.3 percent in 1970 to 49.8 percent in 1995. Louisiana's largest share of the Gulf Region black drum harvest was 83.7 percent which occurred in 1988. From 1984 through 1994 Louisiana had led the Gulf Region in commercial landings of black drum, but as the Louisiana share dropped the Texas landings have increased substantially. Texas landings increased to 71% and Louisiana's decreased to 27% in 1996, our lowest share in the last 15 years. (Note: 36 % for 1997; For more historical information on landing for Louisiana and the Gulf Region, see Table 3.2).

Commercial annual dockside value is determined by the ex-vessel price received and quantity landed. The annual commercial dockside value of black drum has increased from \$32,644 dollars in 1970 to \$2,332,328 in 1995. This increase reflects both an increase in annual landings and in the per pound dockside price (Table 3.4).

Much of the increase in the dockside value of black drum during the 1970-95 period was inflationary based. The value of the black drum fishery in Louisiana, after removing the effects of inflation using the 1982-84 consumer price index as the base, increased by a factor of 18.3 from \$84 thousand annually in 1970 to over \$1.5 million annually in 1995. The 18.3 factor increase in dockside value without inflation is significantly smaller than the factor increase of 71.4 with inflation. Table 3.5 shows that the deflated dockside price of black drum landings increased by a factor of only 2.7 from 1970 to 1995.

Black drum are sold in various size categories and are normally classified as puppy drum (1-2 lb.), small (2-5 lb.), medium (6-10 lb.) and large or bull drum (10 + lbs). Puppy drum are not a very desirable fish in most markets (with some exceptions in the Cameron Parish Area) and are therefore not considered commercially important (Pearce *et al.* unpublished ms 1989). The small(2-5 lb.)black drum landed in Louisiana are marketed largely in Louisiana and adjacent gulf states and are normally sold fresh in the form of drawn or dressed. The most important market for black drum are the restaurant and food service outlets. Over 90 percent of the large black drum are marketed out of state as filets (Leard *et al.* 1993).

Table 3.5 presents the annual range of ex-vessel black drum dockside price per pound for various size categories from 1988 - 1997. The midpoint ex-vessel dockside price per pound range for the small black drum category is 1.4 and 4.1 times higher than for the medium and large "bull" black drum categories, respectively. Note that the large variation in ex-vessel dockside price per pound received by commercial fishermen for the various market size categories could substantially influence the average annual reported black drum landing value per pound.

Since the black drum fishery comprises a single component of Louisiana's commercial fishing sector, it is important to identify the change in commercial harvest revenues that would be associated with a decline in commercial catches of black drum. Most fishermen are multi-species fishermen and gear used in one fishery can be utilized for harvest of other species. Thus, overall industry revenues may not decline proportionately with declining landings because commercial fishermen can often redirect efforts to other species. Thunberg *et al.* (1991) concluded that restrictions on red drum harvest led to only a moderate decline in revenues from Florida's near-shore fishery because fishermen were able to redirect efforts to other near-shore species. They also found the ability to switch to other species was geographically dependent. Caution should be exercised when applying these results to Louisiana because the ability to redirect commercial effort will become increasingly limited as additional restrictions are placed on more species. Income derived from other species such as black drum may be important in keeping these multi-species fishermen in the industry (William *et al.* 1980).

3.3 Recreational Fishery

Black drum are not a primarily targeted species of sports fishermen. Most recreational fishermen land black drum as incidental catch, with only a small percentage citing them as a desired species, as evidenced by the 1984 Louisiana Department of Wildlife and Fisheries creel census results (Adkins *et al.* 1990). According to that report, coastal Louisiana fishermen targeted primarily red drum and spotted seatrout, by 49.3% and 63.8% respectively, and no other species by more than 4%, in this order: largemouth bass, silver/sand seatrout, red snapper, black drum (0.6%), croaker, flounder, king mackerel, and blue catfish. Of the total number of fish caught, 75% consisted of red drum, sea catfish, spotted seatrout, and croaker. The only others to each add to greater than 1% of the total catch, in order of abundance, were sheepshead, black drum (3.3%), largemouth bass, flounder, and bluegill. These findings are further corroborated by the results of Marine Recreational Fishery Statistics Survey (MRFSS) data (in Table 3.1) demonstrating that most saltwater fishermen land black drum as incidental catch with only a small percentage actually targeting black drum as a desired species. The 1993 recreational saltwater survey indicated that spotted seatrout and red drum are the primary targeted saltwater species of about 90% of Louisiana saltwater anglers who expressed preferred species (Kelso *et al.* 1994). Flounder was the third most preferred species followed by black drum and red snapper. Similar results were reported in the 1990 and 1991 recreational surveys. Many anglers indicate no preference for a particular species as indicated in Table 3.1. The percentage of respondents that indicate no preference in the 1990, 1991 and 1993 recreational surveys ranged from 13% to 40%, depending on the survey. (Kelso *et al.* 1990, 1991, and 1993). Figures from reports from MRFSS (1980 - 1994) indicate the percent of Louisiana fishermen who preferred black drum ranged from 0.1% to 2.3% averaging 0.7%, though fishermen with no preference comprised the highest category ranging from 19% to 59% (Table 3.1).

The 1990 and 1991 recreational surveys indicated that having a diversity of species to fish for was important to all anglers and that the satisfaction of a fishing trip increased with the number of fish caught (Kelso *et al.* 1990 and 1991). The 1993 recreational survey revealed that a majority (73.9%) of the saltwater anglers were satisfied with current black drum regulations (Kelso *et al.* 1994).

3.3.1 Description of Fishing Activities

Various recreational surveys (MRFSS, Adkins *et al.* 1990) state that the Louisiana fishermen who targeted black drum preferred small fish (less than 5 pounds). They utilized a variety of small boats and tackle, largely inshore within short distances from the coast. Many black drum were also caught from the bank, near man-made structures, such as bridges and oil rigs, both inshore and in Gulf waters. Recreational fishermen caught drum more frequently from October through February. The larger average size fish were caught April through September with largest fish being caught in passes during February and March. These "bulls" are more heavily targeted for fishing rodeos. Baits commonly used were crab, clam, shrimp and cut fish. Black drum are usually fished with bottom rigs utilizing casting equipment and occasionally hand-lines.

3.3.2 Effort and Harvest

Recreational black drum landings for Louisiana before the implementation of regulations (1980-1988) reveal a wide range in numbers landed, averaging approximately 500,000 individuals with apparent fourth year peaks possibly due to good recruitment of year one fish. A recreational bag limit and size limits were introduced in October 1989. These limited recreational fishermen to a creel limit of five fish from 16 to 27 inches in length, with an allowance of one fish that may be over 27 inches). The average harvest decreased to approximately 160,000 fish annually under these regulations. It should also be noted that these landings reflect a pre-regulation/post-regulation release rate of approximately 30% pre- to 66% post- respectively (Figure 11).

The MRFSS summary of recreational landings by percentage of individual fish by state for 1979 through 1997 is summarized in Table 3.6, updating the information of Sutter *et al.* (1986). This table also indicates the gulfwide modes most commonly used for capturing black drum.

The catch figures listed in Table 3.6 are estimates of all drum caught, including those released, used for bait or otherwise unavailable. There is a considerable bank/shore segment of the black drum fishery which represents an average of 36% of the total MRFSS catch from 1979 through 1997. The average weight of black drum landed in Louisiana during this period was 3.0 pounds. The average number of fish harvested in Louisiana's recreational fishery (1979-1997) was 424,007 fish (Figure 11). MRFSS figures from 1981 through 1995 indicate that an average of 68.9% per year, of the black drum harvested, were caught inshore.

Information provided by the National Marine Fisheries Service on numbers, poundage, and average harvest weight of black drum caught and harvested by Louisiana recreational anglers are presented in Figure 11 for the years 1979 through 1997. The percent of the total catch harvested has decreased since 1981, while the average harvest weight and release rates increased. Average harvest weight of black drum increased from 2.8 pounds prior to 1989 to 3.8 pounds through 1997. The percent of black drum harvest of total recreational harvest (all species) declined from 2.7% in 1981 to 1% in 1994 and has since begun to increase to 3.8 % in 1997 (Table 3.7). The average number of black drum released has approximately doubled since 1988 (Table 3.7, Figure 11). These changes and variations in the annual recreational black drum data may be caused by a number of factors including: changes in angler attitudes toward black drum; changes in laws and regulations such as bag and size limits; or reduced abundance of black drum caused by biological, climatological, environmental or habitat factors; or increases in harvest of other (target) species; however, these are probably due to regulation changes requiring release.

Adkins *et al.* (1990) estimated that 105,778 black drum averaging 15.5" were harvested recreationally by Louisiana fishermen during 1984. Of the drum caught by anglers in the 1984 LDWF survey, 69% were kept.

Louisiana required a recreational saltwater license beginning in the 1984-1985 season with 102,125 sold initially. From 1985 through 1989 resident salt water license sales averaged 195,000. The number of these licenses sold from 1990 through 1994 averaged 246,000 and further increased to 296,959 for 1995-1996. They have decreased slightly to the 1997-98 season when resident saltwater sales went to 284,198 (Figure 12). In the "Non-resident" category of figure 12, prior years included some portion of freshwater (FW) fishermen (approximately 25%) : a new 1996-97 category exhibited 10,923 three-day FW only licenses; the old two-day license allowed both salt and FW fishing. The differences in the licenses sold and the MRFSS estimates of angler numbers is partly due to the exemption of ages under 16 and over 60 from recreational licensing requirements, but may also include error in the estimation of the numbers of anglers.

Adkins *et al.* (1990) conservatively estimated there were 150,000 recreational saltwater fishermen in Louisiana during 1984. Saltwater licenses were required by 105,000 while 45,000 were exempt due to age. These fishermen averaged 15 days of saltwater fishing per year and 5.3 hours per trip. A total of 7,658,560 hours of fishing effort was estimated for the year. They also noted that the number of 1984 trips was 43.6% less than the National Marine Fisheries Service (NMFS) average from 1979 to 1983 and 1985. Some of this reduction may have been due to the severe freeze of December, 1983, causing many anglers to believe no fish were available. The range of catch per effort for black drum for the period during 1984 LDWF census was 0.01-0.25 drum per trip. The average catch was 0.014.

Comparisons using these recreational landings to those of commercial landings can be useful; however, they should be interpreted cautiously due to the differences in survey techniques and extrapolations. While it appears that recreational landings were much higher than commercial landings up to 1978, Fitzhugh and Beckman (1987) gave several reasons for using these "independently...as trend indicators."

The IGFA all-tackle world record black drum is a 113 pound fish taken off Delaware, September 15, 1975. Although larger black drum have been reported (Welsh and Breder 1923), they were not included in the records. Fish caught in the Gulf of Mexico usually range from 1 to 3 pounds and from 10 to 40 pounds in Atlantic coastal waters (Silverman 1979). The Louisiana Outdoor Writer's Association (LOWA) Louisiana record is 77 pounds, 0 ounces, caught by Timothy Joseph Darcey, April 1975. (Ford 1996).

3.3.3 Economics of Recreational Fishing

Recreational fishing is a highly diverse activity and has economic value. Participants are seeking a recreational experience and are willing to pay more for this activity than it actually costs them. Households actually "produce" recreational trips by allocating their time, buying market services, and combining these with publicly provided natural resources (McConnell and Strand 1994). The value of recreational fishing is variable across individuals and trips. It will depend on many conditions--the quality of fishing, the weather, the skill of the angler, etc.

There are two kinds of economic value for recreational fishing. One is the access value to a resource. Access pertains both to the overall opportunity for fishing and to the opportunity for fishing in specific locations. The value of access is what anglers would pay rather than do without or the amount they would accept as compensation for their loss of access. The second kind of economic value is the value of catching an additional fish. This is the amount an angler is willing to pay to catch more fish, larger fish, or more desirable fish. This amount will depend on many things, such as the species sought, the time when fishing takes place, the mode of fishing, the weather, environment, etc.

The estimation of the value of a recreational fishery such as black drum will involve the measure of species specific effort and the expenses incurred. There have been several studies made to collect total numbers of recreational fishermen, percentage of fishermen targeting various species, average number of fishing trips per year, and expenditures per trip. Data from these studies have been highly variable among studies, even over the same time period. Conclusions drawn from these studies should therefore be viewed with caution.

Recreational fishing effort depends primarily upon the number of fishermen and number of trips per fisherman. Individual fishing effort is largely a function of the expenses incurred in the activity and the perceived benefits received from the activity. As costs rise and benefits remain the same, effort tends to decrease. Costs can increase through increased spending, in relation to other leisure activities, or fraction of disposable income. Anglers can receive both tangible and intangible benefits from fishing activities. Tangible benefits include the number or quality of fish caught. Intangible benefits can be enjoyment of the outdoors, change in routine, companionship, etc.

Fishing effort will continue as long as the economic costs are not greater than the anglers satisfaction (or what economists call utility). Net Fishing benefits (satisfaction minus costs) may decline due to satiation, declining catch per angler, congestion at favored locations, degradation of aesthetic value of trips, or from increased fishing costs.

Direct expenditures per trip for marine recreational anglers in Louisiana were estimated at \$53 (Kelso *et al.* 1992), \$64 (Bertrand 1984), \$75 (Kelso *et al.* 1991), and \$133 (Titre *et al.* 1988). Direct expenditures include spending for automotive and boat fuel, lodging, food and drinks, ice, boat launch fee, bait, and other expenses directly related to the trip. In addition to trip expenditures, anglers purchase equipment (boats, motors, trailers, vehicles) and speciality gear. This equipment is used for more than one trip and even over several years. Their costs need to be allocated over time. Published annual estimates of these expenses vary widely depending on what is included: \$698 (U.S. Fish and Wildlife Service 1993), \$824 (Kelso *et al.* 1991), and \$1108 (Kelso *et al.* 1992).

Bertrand (1984) estimated total annual expenditures by saltwater anglers in Louisiana as 180.6 million dollars. Estimates can also be calculated from other surveys. From a 1985 survey, the U.S. Fish and Wildlife Service (1988) estimated that state residents spent a total of \$197 million dollars on saltwater fishing expenses, including equipment and trip-related expenses. Nonresident fresh and saltwater anglers spent an estimated \$36.7 million in trip-related expenses in Louisiana.

To estimate total nonresident saltwater expenses, nonresident expenditure data was adjusted by the same proportion as the state resident spending for fresh and saltwater fishing trips. This yields total saltwater expenditures of \$210 million. From the next survey in 1991, the U.S. Fish and Wildlife Service (1993) estimated expenditures of 158.8 million dollars by state residents on saltwater angling. Nonresident fresh and saltwater anglers spent an estimated \$60.3 million in trip-related expenses in Louisiana. As in the 1985 U.S. Fish and Wildlife survey, expenditures of nonresident anglers were not broken out by fresh and saltwater expenditures. However, from the 1991 survey data, the Sport Fishing Institute estimated that expenditures of saltwater anglers in Louisiana total \$183.3 million (Fedler *et al.* 1991).

Direct expenditures for the fishing trip may be less than the angler would be willing to pay for the entire experience. The difference between the costs of the trip and what the angler is willing to pay is called consumer's surplus. This is a measure of the value that the angler receives for benefits other than the fishing activity. Titre *et al.* (1988) found that the average recreational user would be willing to pay approximately \$320 to \$360 annually for the right to recreate in Louisiana wetlands under certain conditions of harvest, catch, and amenity situations. This \$320 to \$360 represents an estimate of the consumer's surplus and when added to direct expenditures, provides a total economic value for an angler's trip.

4.0 RESEARCH NEEDS

The following data needs and priority research areas have been identified:

1) Fishery Dependent Data Collection

This includes characterization of commercial gear types utilized, areas fished, size of harvest, age of harvest, reproductive data, and other trip specific information not available through standard NMFS reporting methods. This information is necessary because it allows more accurate identification of the fishery, e.g., extrapolations of catch per effort, water-body specific landings, and length or age frequency of the harvest, for stock assessment purposes.

Recent legislation has brought substantial change to the character of the black drum fishery, other estuarine fisheries, and their associated markets. Close monitoring will be necessary in order to react properly and in a timely manner to changes in the fisheries as effort and gear are redirected.

Current methods available for monitoring recreational impact and changes are limited. Additional surveys of recreational fishermen are needed to improve catch per effort information and detect changes in the important recreational species composition by size, age, etc. This would allow us to more precisely monitor changes and evaluate existing management measures.

In the presence of changing regulations, fishery-dependent information alone is not a reliable source of data for assessing the status of a fish stock. However, such data are necessary to measure the effects of fishing on that stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery stocks, and to identifying causes of changes in stock abundances. Present programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified or enhanced to optimize their capabilities.

2) Fishery Independent Data

Fishery independent monitoring provides population structure data rather than harvest information. This provides relative abundance, indices of relative year class strengths, and success of spawns. It also helps management by targeting segments of black drum populations (and other species) where life history information is lacking.

Saucier And Baltz (1993) suggested further studies that would "... characterize habitat selection in terms of spatial and temporal variation...relative to other life history events that influence reproductive success." They proposed that by modeling the habitat selected for spawning, the quantity of suitable habitat and spawning success could be predicted given specific environmental conditions (most of which influence salinities).

3) Tagging

This type of information allows insight to movements and behavior, e.g., escapement and growth rates needed to assist in determining the spawning stock biomass. The extent of migrations of large schools within their range is not known, and this is pointedly true for the medium sized black drum prior to reaching maturity (ages 4-6 years) where they have largely "disappeared" from the fishery dependent landings information.

4) DNA Electrophoresis

Further analysis of genetic tracers are needed to determine if different stocks exist, and potential interactions between stocks in different areas of Louisiana or Gulf waters.

5) Age and Growth

Characterization of this species' populations through use of otolith ageing and various validation techniques should be continued and encouraged.

7) Social and Economic Information

Social and economic information is needed on participants of the black drum fishery. Information on other fisheries that these black drum fishers participate in, processing and marketing cost, investment, operating and harvesting costs, could help identify the health of the industry and impacts of regulatory changes on participants in the fisheries. In addition, a description of the marketing system, product forms and value added estimates by the various marketing sectors is needed.

5.0 LITERATURE CITED

- Adkins, G., V. Guillory, and M. Bourgeois. 1990. A creel survey of Louisiana recreational saltwater anglers. pp. 5-57 *in*: Louisiana Department of Wildlife and Fisheries, Technical Bulletin Number 41.
- Bane, G.W., S.J. Russell, J.H. Render, C. Boulet, S. Ellsworth, and S. Locy. May 1985. Commercial mackerel, snapper, grouper, black drum, mullet, and inshore shrimp fisheries research program in Louisiana Annual Report. Publication No. LSU-CFI-85-52, Center for Wetland Resources, Louisiana State University, Baton Rouge. pp. 55-86.
- Barrett, B.B., J.L. Merrell, T.P. Morrison, M.C. Gillespie, E.J. Ralph, and J. F. Burdon. 1978. A study of Louisiana's major estuaries and adjacent offshore waters. Louisiana Department of Wildlife and Fisheries. Seafood Division. Technical Bulletin No. 27. 197 pp.
- Bean, T.H. 1902. Drum (*Pogonias cromis* Linnaeus), in Food and Game Fishes of New York. New York Forest Fish and Game Comm. 7th Report, Albany, New York. pp. 433-434.
- Beckman, D.W. 1989. Age and growth of red drum (*Sciaenops ocellatus*) and black drum (*Pogonias cromis*) in the northern Gulf of Mexico. Doctoral dissertation, Louisiana State University, Baton Rouge, Louisiana.
- Beckman, D.W., C.A. Wilson, R.M. Parker, D.L. Nieland, and A.L. Stanley. 1988. Age structure, growth rates, and reproductive biology of black drum in the northern Gulf of Mexico off Louisiana. 1986-87 Final Report to U.S. Department of Commerce, Marine Fisheries Initiative (MARFIN) program.
- Beckman, D.W., A. L. Stanley, J.H. Render and C.A. Wilson. 1990. Age and growth of black drum in Louisiana waters of the Gulf of Mexico. Trans. Amer. Fish. Soc. 119:537-544.
- Bere, R. 1936. Parasitic copepods from Gulf of Mexico fish. Am. Midl. Nat. 17(3):577-625.
- Bertrand, A.L. 1984. Marine recreational finfishermen in Louisiana: a socioeconomic study of licensed recreational finfishermen fishing in Coastal Study Area IV. Report by Socio-Technical Consultants, Inc. LSU-CEFI-84-26, 36 pp.
- Breuer, J.P. 1957. An ecological survey of Baffin and Alazan Bays, Texas. Pub. Inst. Mar. Sci. Univ. Texas 4(2):134-155.
- Bumguardner, B.W., R.L. Colura, E. Young, D. Westbrook, and R. Buckley. 1995. Project 18: Determination of Selected Life History Characteristics of Black Drum (*Pogonias cromis*) along the Texas Gulf Coast. Sport Fish Restoration. Final Report: F-36-R, Marine Fisheries

Resource Culture and Enhancement. Texas Parks and Wildlife Department, Coastal Fisheries Division. Austin.

- Campana, S.E. and C.M. Jones. 1998. Radiocarbon from nuclear testing applied to age validation of black drum, *Pogonias cromis*. Fishery Bulletin 96(2):185-192.
- Cate, A.S., and I. Evans. 1994. Taphonomic significance of the biomechanical fragmentation of live molluscan shell material by a bottom-feeding fish (*Pogonias cromis*) in Texas coastal bays. *Palaos* 9(3):254-274.
- Cave, R.N. 1978. Predator-prey relationships involving the American oyster, *Crassostrea virginica* (Gmelin), and the black drum, *Pogonias cromis* (Linnaeus), in Mississippi Sound. MS Thesis, Southeastern Louisiana University. 43 pp.
- Chao, L.N. 1976. Aspects of systematics, morphology, life history, and feeding of western Atlantic Sciaenidae (Pisces:Perciformes). Ph.D. Thesis. College of William and Mary. 340 pp.
- Chao, L.N. 1978. A basis for classifying Western Atlantic Sciaenidae (Teleostei: Perciformes). NOAA Tech., Rept. Circ. 415. 64 pp.
- Cody, T.J., K.W. Rice, and C.E. Bryan. 1985. Distribution and gonadal development of black drum in Texas gulf waters. Texas Parks and Wildlife Department. Coastal Fisheries Branch, Management Data Series No. 72. 16 pp.
- Cowan, J.H., R.S. Birdsong, E.D. Houde, J.S. Preist, W.C. Sharp, and G.B. Mateja. 1992. Enclosure experiments on survival and growth of black drum eggs and larvae in lower Chesapeake Bay. *Estuaries* 15(3):392-402.
- Daniel, L. B., and J.E. Graves. 1994. Morphometric and genetic identification of eggs of spring-spawning sciaenids in lower Chesapeake Bay. *Fishery Bulletin* 92(2):254-261.
- Darnell, R.M. 1958. Food habits of fishes and larger invertebrates of Lake Pontchartrain, Louisiana, an estuarine community. *Publ. Mar. Inst. Sci., Univ. Tex.* 5:353-416.
- Ditty, J.G. 1986. Ichthyoplankton in neritic waters of the Northern Gulf of Mexico off Louisiana: Composition, relative abundance, and seasonality. *Fishery Bulletin* 84:935-946.
- Doerzbacher, J.W., A.W. Green, G.C. Matlock, and H.R. Osborn. 1988. A temperature compensated von Bertalanffy growth model for tagged red drum and black drum in Texas bays. *Fisheries Research* 6:135-152.
- Dugas, C.N. 1986. Food habits of black drum, *Pogonias cromis*, in southeast Louisiana with emphasis on their predation of the American oyster, *Crassostrea virginica*. *Cont. Louisiana*

- Department of Wildlife and Fisheries Marine Lab, Grand Terre, Louisiana. 1981-1985. Technical Bulletin No. 40. pp. 32-39.
- Evermann, B.W and B.A. Bean. 1898. Indian River and its fishes. Report U.S. Commercial Fish and Fisheries for 1896.
- Fedler, Anthony J. and David M. Nickum. The 1991 Economic Impact of Sport Fishing in Louisiana, Sport Fishing Institute, Washington, D.C., U.S. Fish and Wildlife Cooperative Grant Agreement No. 14-48-0009-93-1248.
- Fiedler, R.H. 1930. Fishery industries of the United States. Appendix II to Report of Commissioner of Fisheries for the Fiscal Year 1931. U.S. Bureau of Fisheries. pp. 410-419.
- Fitzhugh, G.R., and D.W. Beckman. 1987. Age, growth and reproductive biology of black drum (*Pogonias cromis*) in Louisiana. Coastal Fisheries Institute, Center for Wetland Resources, Louisiana State University.
- Fitzhugh, G.R., T.G. Snider, and B.A. Thompson. 1987. Ovarian development, fecundity, and spawning frequency of black drum, *Pogonias cromis*. In: G.R. Fitzhugh and D.W. Beckman. Age, growth and reproductive biology of black drum in Louisiana waters. Final report to Louisiana Board of Regents. 89 pp.
- Fitzhugh, G.R., B.A. Thompson , and T.G. Snider. 1993. Ovarian development, fecundity, and spawning frequency of black drum *Pogonias cromis* in Louisiana. Fishery Bulletin 91(2):244-253.
- Fontenot, B.J., Jr., and H.E. Rogillio. 1970. A study of estuarine sportfishes in the Biloxi Marsh complex, Louisiana. Louisiana Wildlife and Fisheries Commission Fish Bulletin No. 8. 172 pp.
- Ford, B., curator. Official Fish Records. 1996. Louisiana Outdoor Writer's Association. LOWA Fish Records Committee. Clinton, Louisiana.
- Fox, L.S., and W.R. Mock. 1968. Seasonal occurrence of fishes in two inshore habitats in Barataria Bay, Louisiana. Proceedings of the Louisiana Academy of Science 31:43-53.
- Frisbie, C.M. 1961. Young black drum. *Pogonias cromis*, in tidal fresh and brackish waters especially in the Chesapeake and Delaware Bay areas. Chesapeake Science 2:94-100.
- Geaghan, J., and G. Garson. Unpublished draft. Population dynamics and stock assessment of black drum, Louisiana waters. 1989 Report to chairmen of Louisiana SASC and TWG.

- Gilhen, J. 1986. The second and third records of the black drum *Pogonias cromis*, from the Canadian Atlantic. *Canadian Field-Naturalist* 100(1):125-126.
- Gold, J.R., L.R. Richardson, C. Furman, and F. Sun. 1994. Mitochondrial DNA diversity and population structure in marine fish species from the Gulf of Mexico. *Canadian Journal of Fisheries and Aquatic Sciences* 51(S1):205-214.
- Gowanloch, J.N. 1933. *Fishes and Fishing in Louisiana*. La. Dept. of Conservation, Bulletin 23. 628 pp. (Reprint 1965 with addenda by Claude "Grits" Gresham, Claitors Book Store, Baton Rouge, La.).
- Greenwood, P., D. Rosen, W. Weitzman, and G. Meyers. 1966. Phyletic studies of teleostean fishes, with a provisional classification of living forms. *Bull. Am. Mus. Nat. Hist.* 131:341-455.
- Gunter, G. 1945. *Studies on the marine fishes of Texas*. Publ. Inst. Mar. Sci. Univ. Tex. 1(1):1-190.
- Harrington, R.A., G.C. Matlock, and J.E. Weaver. 1979. Standard-total length, total length-whole weight and dressed whole weight relationships for selected species from Texas bays. Technical Series Number 26. Texas Parks and Wildlife Department. Austin, Texas.
- Hein, S., C. Dugas, and J. Shepard. 1980. Total length-standard length and length-weight regressions for spotted seatrout, *Cynoscion nebulosus*; red drum, *Sciaenops ocellata*; and black drum, *Pogonias cromis*, in south-central Louisiana. Louisiana Department of Wildlife and Fisheries Technical Bulletin No. 31.
- Henderson- Arzapalo, A., R. Colura, and A. Maciorowski. 1994. A comparison of black drum, red drum, and their hybrid in saltwater pond culture. *Journal of the World Aquaculture Society* 25(2):289-296.
- Higgins, E., and R. Lord. 1926. Preliminary report on the marine fisheries of Texas. Appendix IV to the report of the U. S. Commissioner of Fisheries for 1926. U.S. Bureau of Fisheries. pp. 167-197.
- Hildebrand, S.F., and W.C. Schroeder. 1928. *Fishes of Chesapeake Bay*. U.S. Bur. Fish. Bull. 43(1):1-388.
- Hoese H.D., and R.H. Moore. 1977. *Fishes of the Gulf of Mexico, Texas, Louisiana and adjacent waters*. Texas A & M Univ. Press, 327 pp.
- Holt, G.J., S.A. Holt, and C.R. Arnold. 1985. Diel periodicity of spawning in sciaenids. *Marine Ecology Progressive Series* 27:1-7.

- Holt, S.A., G.J. Holt, and L. Young-Abel. 1988. A procedure for identifying sciaenid eggs. *Contributions in Marine Science* 50(supplement):99-108.
- Horst, J. 1986. Louisiana seafood products handbook: A reference guide to species, availability, product forms, and fisheries facts. Louisiana Seafood Promotion and Marketing Board in cooperation with the Louisiana Cooperative Extension Service and the Louisiana Sea Grant College Program. Baton Rouge.
- Hunter, J.R., and B.J. Macewicz. 1985. Measurement of spawning frequency in multiple spawning fishes. Pages 79-94. In: R. Lasker (editor). An egg production method for estimating biomass in pelagic fish: Application to the northern anchovy, *Engraulis mordax*. NOAA Technical Report NMFS 36.
- Hunter, N. 1996. personal communications. Louisiana Dept. of Wildlife & Fisheries, Commercial License Section. Baton Rouge, Louisiana.
- Jannke, T.E. 1971. Abundance of young sciaenid fishes in Everglades National Park, Florida, in relation to season and other variables. University of Miami Sea Grant Technical Bulletin 11. 128 pp.
- Johnson, G.D. 1978. Development of fishes of the Mid Atlantic Bight. *U.S. Dept. Int.* 4:235-241.
- Jordan, D.S., and B.W. Evermann. 1896. The fishes of North and Middle America. *U.S. Natl. Mus. Bull.* 47 (Part 1). pp. i-ix, 1-1240.
- Jordan, D.S., and B.W. Evermann. 1898. The fishes of North and Middle America. *U.S. Natl. Mus. Bull.* 47 (Part 2):11241-12183.
- Joseph, E.B., W.H. Massman, and J.J. Norcross. 1964. The pelagic eggs and early larval stages of the black drum from Chesapeake Bay. *Copeia* 1964(2):425-434.
- Karel, W.J., Ward, R., and I.R. Blandon. 1995. Project 20: Allozyme analysis of population structure in black drum (*Pogonias cromis*) inhabiting the Texas Gulf Coast. Sport Fish Restoration. Final report: F-36-R, Marine Fisheries Resource Culture and Enhancement.. Texas Parks and Wildlife Department, Coastal Fisheries Division. Austin.
- Kelso, W.E, B.D. Rogers, D.A. Rutherford, and D.R. Rogers. 1991. 1990 Survey of Louisiana Sport Fishermen. Louisiana State University Agricultural Center and Louisiana Department of Wildlife and Fisheries. Baton Rouge.
- Kelso, W.E, B.D. Rogers, D.A. Rutherford, and D.R. Rogers. 1992. Survey of Louisiana Recreational Anglers 1991. Louisiana State University Agricultural Center and Louisiana Department of Wildlife and Fisheries. Baton Rouge.

- Kelso, W.E, Barton D. Rogers, Tania A. Bahel, D.A. Rutherford, and Dona R. Rogers. 1994. 1993 Survey of Louisiana Saltwater Anglers. Louisiana State University Agricultural Center and Louisiana Department of Wildlife and Fisheries. Baton Rouge.
- Kemp, R.L. 1949. Report on stomach analysis from June 1, 1949, through August 31, 1949. Tex. Game, Fish, Oyst. Comm. Mar. Lab. Ann. Rep. 1948-1949:100-127.
- Keney, P.M. and Z.P. Zein-Eldin. 1986. Growth and survival of juvenile black drum (*Pogonias cromis*) and their potential for aquaculture. Southeast Fisheries Center, NMFS. Galveston, Texas.
- Leard, R., R. Matheson, K. Meador, W. Keithly, C. Luquet, M. Van Hoose, C. Dyer, S. Gordon, J. Robertson, D. Horn, and R. Scheffler. 1993. The black drum fishery of the Gulf of Mexico, United States: A regional management plan. Gulf States Marine Fisheries Commission, No. 28.
- Lohoefer, R., C. Roden, W. Hoggard, K. Mullin, and C. Rogers. 1988. Distribution, relative abundance, and behavior of near-surface schools of large red drum (*Sciaenops ocellatus*) in the north-central Gulf of Mexico. NMFS Southeast Fisheries Center, Mississippi Laboratories, Pascagoula Facility, Pascagoula, Mississippi.
- Louisiana Department of Wildlife and Fisheries. 1992. Unpublished fish kill report. memo. by R.H. Blanchet, Marine Fisheries Division, September, 1992.
- Marcello, R.A., Jr., and R.K. Strawn. 1972. The cage culture of some marine fishes in the intake and discharge of a steam-electric generating station, Galveston Bay, Texas. Texas A & M University, Sea Grant Coll. TAMU-SG-72-306. 207 pp.
- Massey, L. L., and D. E. Harper. 1993. Selected computer images of southeastern U.S. marine fishes. NOAA Technical Memorandum NMFS-SEFSC-333, 49 pp.
- Matlock, G.C. 1990. Maximum total length and ages of black drum, *Pogonias cromis* (Osteichthyes:Sciaenidae) off Texas. Northeast Gulf Science 11(2):171-174.
- Matlock, G.C., R. Colura, and L. McEachron. 1993. Direct validation of black drum (*Pogonias cromis*) ages determined from scales. Fishery Bulletin 91(3):558-563.
- McConnell, K.E., and I.E. Strand. 1994. The Economic value of Mid and South Atlantic sportfishing. University of Maryland, College Park.
- McEachron, L.W., J.F. Doerzbacher, G.C. Matlock, A.W. Green, and G.E. Saul. 1988. Reducing the bycatch in a commercial trotline fishery. U.S. National Marine Fisheries Bulletin 1988:109-118.

- Miles, D.W. 1949. A study of the food habits of the fishes of the Aransas Bay area. Tex. Game, Fish, Oyst. Comm. Mar. Lab. Ann. Rep. 1948-1949:127-169.
- Miller, G.L., and S.C. Jorgenson. 1973. Meristic characters of some marine fishes of the western Atlantic Ocean. U.S. NMFS Fish. Bull. 71(1):301-312.
- Mok, H.K., and R.G. Gilmore. 1983. Analysis of sound production in estuarine aggregations of *Pogonias chromis*, *Bairdiella chrysura*, and *Cynoscion nebulosus* (Sciaenidae). Bulletin of the Institute of Zoology, Academia Sinica 22: 157-186.
- Murphy, M.D., and R. G. Taylor. 1989. Reproduction and growth of black drum, *Pogonias cromis* in northeast Florida. Northeast Gulf Science 10(2):127-137.
- Nieland, D.L., and C.A. Wilson. 1993. Reproductive biology and annual variation of reproductive variables of black drum in the northern Gulf of Mexico. Transactions of the American Fisheries Society 122(3):318-327.
- Nieland, D.L., and C.A. Wilson. 1995. Histological abnormalities and bacterial proliferation in red drum and black drum ovaries. Transactions of the American Fisheries Society 124(1):139-143.
- Noguera R., J. H. 1994. Age and growth characteristics of prehistoric freshwater drum, *Aplodinotus grunniens*, in Louisiana and prehistoric black drum, *Pogonias cromis*, and red drum, *Sciaenops ocellatus*, in Texas. M.S. Thesis, Dept. of Oceanography and Coastal Sciences, L.S.U. Baton Rouge. 105 pp.
- Osburn, H.R., and G.C. Matlock. 1984. Black drum movement in Texas bays. North American Journal of Fisheries Management 4:523-530.
- Overstreet, R.M. 1977. *Poecilancistrum caryophyllum* and other trypanorhynch cestode plerocercoids from the musculature of *Cynoscion nebulosus* and other sciaenid fishes in the Gulf of Mexico. The Journal of Parasitology 63(5):780-789.
- Overstreet, R.M. and R.W. Heard. 1982. Food contents of six commercial fishes from Mississippi Sound. Gulf Research Reports. 7(2):137-149.

- Parker, R.M., D.L. Nieland, D.W. Beckman, and C.A. Wilson. 1988. Reproductive biology of black drum *Pogonias Cromis* in the northern Gulf of Mexico. In: D.W. Beckman, C.A. Wilson, R.M. Parker, D.L. Nieland, and A.L. Stanley. Age structure, growth rates, and reproductive biology of black drum in the northern Gulf of Mexico off Louisiana. 1987-88 Final Report to U. S. Department of Commerce, Marine Fisheries Initiative (MARFIN) program.
- Pearce, H. 1989. unpublished. AD-Hoc Black Drum Advisory Committee, draft report to Louisiana Marine Finfish Panel Sept., 1989. Louisiana Cooperative Extension Service. Louisiana State University, Baton Rouge, Louisiana
- Pearson, J.C. 1929. Natural history and conservation of redfish and other commercial sciaenids on the Texas coast. Bulletin of the U.S. Bureau of Fisheries 4:129-214.
- Perret, W.S., B. Barrett, W. Latapie, J. Pollard, W. Mock, G. Adkins, W. Gaidry, and C. White. 1971. Cooperative Gulf of Mexico estuarine inventory and study, Louisiana. La. Wildl. and Fisheries Comm. Phase IV, Biology. pp.51-52.
- Peters, K. M., and R.H. McMichael. 1990. Early life history of the black drum *Pogonias cromis* (Pisces:Sciaenidae) in Tampa Bay, Florida. Northeast Gulf Science 11(1):39-58.
- Powles, H., and B.W. Stender. 1978. Taxonomic data on the early life history stages of Sciaenidae of the South Atlantic Bight of the United States. S.C. Mar. Resour. Cent. Tech. Rep. No. 31, 64 pp.
- Ramsey, P.R., and J.M. Wakeman. 1989. Stock inventories of red drum, spotted seatrout, and black drum: Electrophoretic, demographic, and meristic evidence. Final Report of #NA87FWC-HM136, FY 87-88. Department of Commerce. NOAA. National Marine Fisheries Service. Submitted 02/28/89.
- Render, J.H., and R.M. Parker. 1987. Historical and current trends in the Louisiana black drum fishery. pp 1-25 In: G.R. Fitzhugh, and D.W. Beckman (eds.). Age, growth and reproductive biology of black drum in Louisiana waters. Final report to Louisiana Board of Regents. 89 pp.
- Richards, C.E. 1973. Age, growth, and distribution of the black drum (*Pogonias cromis*) in Virginia. Transactions of the American Fisheries Society 102:584-590.
- Rickliss, R.A. 1988. Archeological investigations at the McKinzie site (41NU221), Nueces County, Texas: Description and contextual interpretation. Bulletin of the Texas Archeological Society 58:(for 1987):1-76.

- Roberts, K. 1989. personal correspondence. Louisiana Cooperative Extension Service, Economics Division. Baton Rouge, Louisiana.
- Robins, C.R., R. Bailey, C. Bond, J. Brooker, E. Lachner, R. Lea, and W. Scott. 1980. A list of common and scientific names of fishes from the United States and Canada. Am. Fish. Soc. Spec. Pub. No. 12, 174 pp.
- Rogillio, H.E. 1975. An estuarine sportfish study in southeastern Louisiana. Dingell-Johnson project for Louisiana Wildlife and Fisheries Commission, F-17, Fisheries Bulletin No. 14:1-55.
- Rogillio, H.E. 1982. Movement study of estuarine sportfish. Louisiana Department of Wildlife and Fisheries, Annual report, 1981-82, D.J. Proj. F-41.
- Ross, J.L., J.S. Pavela, and M.E. Chittenden, Jr. 1983. Seasonal occurrence of black drum, *Pogonias cromis*, and red drum, *Sciaenops ocellatus*, off Texas. Northeast Gulf Science 6(1):67-70.
- Russell, S. 1989. Unpublished Manuscript. History of the Black Drum Fishery in Louisiana. LSU, Center for Wetland Resources, Coastal Fisheries Institute, Baton Rouge, Louisiana. 15 pp.
- Russell, S., J.H. Render, S. Ellsworth, R. Parker, and G. Bane. 1986. Annual Report 1985-86. State/Federal Cooperative Fishery Statistics Program in Louisiana. Publication No. LSU-CFI-86-11, Center for Wetland Resources, Louisiana State University, Baton Rouge. 162 pp.
- Russell, S.J., R.M. Parker, F. Cole, L. Picou, and D. Domengeaux. 1987. Annual Report 1986-87. State/Federal Cooperative Fishery Statistics Program in Louisiana. Publication No. LSU-CFI-87-12, Center for Wetland Resources, Louisiana State University, Baton Rouge. 65 pp.
- Saucier, M.H., and D.M. Baltz. 1993. Spawning site selection by spotted seatrout, *Cynoscion nebulosus*, and black drum, *Pogonias cromis*, in Louisiana. Environmental Biology of Fishes 36:257-272.
- Silverman, M.J. 1979. Biological and fisheries data on black drum, *Pogonias chromis* (Linnaeus). National Marine Fisheries Service Technical Series Report No. 22. 35 pp.
- Simmons, E.G. 1957. An ecological survey of the upper Laguna Madre of Texas. Publications of the Institute of Marine Science, University of Texas 4:156-200.

- Simmons, E.G. and J.P. Breuer. 1962. A study of redfish, *Sciaenops ocellata*, and black drum, *Pogonias cromis*. Publications of the Institute of Marine Science, University of Texas 8:184-211.
- Sutter, F.C., R.S. Waller, and T.D. McIlwain. 1986. Species profiles: life histories and environmental requirements of coastal fisheries and invertebrates (Gulf of Mexico) black drum. U.S. Fish and Wildlife Service Biological Report 82(11.51) U.S. Army Corps of Engineers, TREL-82-4. 10 pages.
- Thomas, D.L. 1971. The early life history and ecology of six species of drum (Sciaenidae) in the lower Delaware River, a brackish estuary. (An ecological study of the Delaware River in the vicinity of Artificial Island, Part III.) Ichthyological Association Bulletin No. 3:1-247.
- Thomas, D.L., and B.A. Smith. 1973. Studies of young of the black drum, *Pogonias cromis* in low salinity waters of the Delaware estuary. Chesapeake Science 14(2):124-130.
- Thompson, B.A., and G.R. Fitzhugh. 1985. Synthesis and analysis of Lake Pontchartrain environments, influencing factors and trends. Louisiana Department of Environmental Quality. Office of Water Resources. LSU-CFI-84-28. 238 pages.
- Thunberg, E., C. Adams, D. Brannan, and T. Taylor. 1991. Commercial fishing revenue losses under harvest restrictions: The case of the Florida red drum. University of Florida Food and Resource Economics Department, Gainesville.
- Titre, J.P., Jr., J.E. Henderson, J.R. Stoll, J.C. Bergstrom, and V.L. Wright. 1988. Valuing wetland recreational activities on the Louisiana coast: Final report to U.S. Army Corps of Engineers, New Orleans District.
- United States Department of Commerce. 1980-1996. National Marine Fisheries Service, Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts. Data files, with 1979-1989 summaries published in the Current Fisheries Statistics Series, various numbers.
- United States Department of Commerce. 1950-1996. National Marine Fisheries Service Preliminary Commercial Landings Statistics Data files, with 1950-1978 summaries published in the Current Fisheries Statistics Series, various numbers.
- U.S. Department of Commerce. 1994. Statistical Abstract of the United States: 1994. Economics and Statistics Administration Bureau of the Census. 114th Edition. U.S. Government Printing Office, Washington, D.C.
- United States Department of the Interior, Fish and Wildlife Service. 1988. 1985 National survey of fishing, hunting, and wildlife associated recreation. U.S. Government Printing Office, Washington D. C.

- United States Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce Bureau of the Census. 1993. 1991 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Government Printing Office, Washington D. C.
- Wallace, R.A., and K. Selman. 1981. Cellular and dynamic aspects of oocyte growth in teleosts. *American Zoologist* 21:325-343.
- Welsh, W.W., and C.M. Breder, Jr. 1923. Contributions to life histories of Sciaenidae of the eastern United States coast. *Bulletin U.S. Bureau of Fisheries* 39:141-201.
- Williams, R.O., W. Tatum, R. Waller, J. Shepard, H. Osburn, E. Nakamura, A. Jernigan, J. Waller, and R. Jones. 1989. The Gulf States Marine Fisheries Commission Spanish Mackerel Fishery Management Plan. Ocean Springs, MS. No. 19.
- World Record Game Fishes. International Game Fish Association. 1987. Ft. Lauderdale, Florida. 320 pp.

Table 2.1 Weight at length of black drum from length/weight regressions of Harrington *et al.* 1979 (TL/WT) and Hein *et al.* 1980 (FL/WT).

FORK LENGTH (inches)	WEIGHT wt (lbs.)	TOTAL LENGTH (inches)	WEIGHT (lbs)
5	0.07	5	0.06
6	0.11	6	0.10
7	0.18	7	0.16
8	0.28	8	0.24
9	0.39	9	0.34
10	0.54	10	0.47
11	0.73	11	0.62
12	0.95	12	0.80
13	1.21	13	1.02
14	1.52	14	1.27
15	1.87	15	1.56
16	2.28	16	1.89
17	2.74	17	2.26
18	3.26	18	2.68
19	3.85	19	3.15
20	4.50	20	3.67
21	5.22	21	4.24
22	6.02	22	4.87
23	6.89	23	5.55
24	7.85	24	6.30
25	8.89	25	7.12
26	10.01	26	7.99
27	11.24	27	8.94
28	12.55	28	9.96
29	13.97	29	11.06
30	15.50	30	12.23
35	24.80	35	19.34
40	37.26	40	28.75
45	53.37	45	40.80
50	73.59	50	55.79
		55	74.05

Table 2.2 Average length and weight of black drum at various ages based on the sloped-asymptote double von Bertalanffy growth equation and length/weight relationship of Beckman *et al.* 1990.

AGE	FORK LENGTH (inches)	TOTAL LENGTH (inches)	WEIGHT (lbs)
1	10.27	10.81	0.59
2	17.09	18.23	2.78
3	20.99	22.51	5.21
4	23.30	25.05	7.16
5	24.73	26.63	8.59
6	25.69	27.69	9.65
7	26.39	28.47	10.47
8	26.95	29.09	11.17
9	27.43	29.63	11.79
10	27.88	30.12	12.38
11	28.30	30.58	12.96
12	28.70	31.03	13.53
13	29.10	31.48	14.12
14	29.50	31.92	14.71
15	29.89	32.36	15.32
16	30.29	32.79	15.94
17	30.68	33.23	16.58
18	31.07	33.67	17.24
19	31.47	34.10	17.91
20	31.86	34.54	18.60
25	33.82	36.72	22.31
30	35.78	38.91	26.50
35	37.74	41.10	31.18
40	39.70	43.30	36.39

Table 3.1. Stated target species groups of recreational anglers in Louisiana. Listed flounders, drum and snappers are total of all preference records in these groups. (Source: NMFS MRFSS data files current as of 6/11/97).

TARGET SPECIES	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96				
NONE	43.56%	55.15%	58.58%	50.70%	45.89%	31.30%	27.03%	28.84%	28.79%	29.68%	21.16%	21.90%	21.61%	19.18%	22.69%	30.16%				
SEATROUT SPOTTED	24.00%	20.10%	12.85%	15.26%	20.67%	41.19%	48.78%	39.99%	37.72%	32.40%	48.73%	39.66%	33.50%	43.75%	34.78%	29.64%				
DRUM RED	12.59%	10.51%	11.33%	20.45%	25.74%	22.12%	16.19%	24.18%	24.92%	27.64%	19.65%	30.02%	34.30%	27.99%	33.52%	34.77%				
TOT OTHER	8.89%	5.71%	3.03%	3.20%	2.91%	1.54%	1.72%	1.54%	2.04%	3.74%	3.13%	2.75%	4.90%	4.64%	3.80%	1.96%				
SNAPPERS	6.37%	3.46%	6.46%	4.93%	2.07%	1.81%	4.84%	0.87%	2.22%	2.41%	3.75%	3.17%	2.39%	1.83%	2.70%	1.47%				
FLOUNDERS	1.93%	1.48%	1.04%	0.80%	0.61%	0.54%	0.52%	2.48%	1.38%	2.20%	1.47%	1.18%	1.59%	0.95%	0.94%	0.47%				
CROAKER ATLANTIC	1.19%	0.71%	1.28%	0.47%	0.52%	0.56%	0.20%	0.77%	0.36%	0.77%	0.42%	0.18%	0.54%	0.27%	0.39%	0.10%				
DRUM BLACK	0.74%	1.13%	2.31%	1.80%	1.32%	0.41%	0.64%	0.40%	0.71%	0.10%	0.27%	0.35%	0.37%	0.27%	0.28%	0.16%				
SHEEPSHEAD	0.44%	0.99%	2.71%	0.93%	0.05%	0.15%	0.04%	0.27%	0.49%	0.10%	0.15%	0.20%	0.20%	0.27%	0.30%	0.13%				
BLUEFISH	0.15%	0.07%		0.07%				0.07%												
MACKEREL KING	0.15%	0.21%	0.08%	0.33%	0.19%	0.18%		0.34%	0.71%	0.05%	0.23%	0.22%	0.14%	0.29%	0.03%	0.16%				
MACKEREL SPANISH	0	0.21%	0.24%		0			0.03%	0.09%	0.20%		0.02%	0.06%							
GROUPERS	0	0.14%		0.73%		0.03%			0.09%					0.02%						
COBIA	0	0.07%	0.08%	0.27%	0.05%	0.07%	0.04%	0.20%	0.44%	0.72%	0.69%	0.16%	0.17%	0.49%	0.50%	0.71%				
AMBERJACK GREATER	0	0.07%		0.07%		0.11%			0.04%			0.18%	0.23%	0.05%	0.08%	0.26%				

Table 3.2. Black drum commercial landings by state from the Gulf of Mexico, 1923 through 1996.

Year	Fla.	Ala.	Miss. (thousands of pounds)	La.	Tx.	Gulf
1923 ^a	142	-	39	60	1,028	1,269
1932 ^b	48	1	89	87	932	1,157
1934 ^b	100	1	4	199	2,253	2,557
1936 ^b	197	2	8	150	2,257	2,614
1939 ^b	84	3	26	150	1,320	1,583
1940 ^b	130	1	14	92	492	729
1945 ^b	986	65	20	301	1,213	2,585
1950 ^b	50	3	20	197	708	978
1951 ^b	36	11	8	235	702	992
1952 ^b	126	3	2	139	614	884
1953 ^b	71	2	5	64	770	912
1954 ^b	45	2	1	68	2,191	2,307
1955 ^b	48	3	14	128	1,972	2,165
1956 ^b	69	5	39	148	1,852	2,113
1957 ^b	62	2	21	184	1,502	1,771
1958 ^c	128	9	28	178	1,071	1,414
1959 ^c	124	10	38	161	1,288	1,621
1960 ^c	191	2	15	190	1,520	1,918
1961 ^c	75	2	23	388	1,635	2,123
1962 ^c	58	2	22	390	1,373	1,815
1963 ^c	100	10	17	344	1,363	1,831
1964 ^c	88	17	46	306	1,409	1,866
1965 ^c	65	3	33	195	1,470	1,766
1966 ^c	65	4	20	247	1,007	1,343
1967 ^c	75	8	33	264	1,061	1,441
1968 ^c	84	16	75	360	677	1,212
1969 ^d	63	43	114	478	610	1,308
1970 ^d	50	24	53	434	783	1,344
1971 ^d	73	31	21	506	1,138	1,769
1972 ^d	96	44	23	540	1,165	1,868
1973 ^d	84	80	14	541	1,208	1,928
1974 ^d	60	53	10	440	1,357	1,920
1975 ^d	35	20	20	276	1,172	1,523
1976 ^d	27	19	48	579	2,091	2,764
1977 ^d	20	25	44	583	1,454	2,126
1978 ^d	34	25	396	580	1,786	2,821
1979 ^d	215	31	1,934	536	1,531	4,247
1980 ^d	312	48	4,045	472	1,058	5,935
1981 ^d	750	89	2,122	2,889	644	6,514
1982 ^d	56	79	1,184	1,690	1,249	4,258
1983 ^d	404	96	1,417	1,859	1,493	5,269
1984 ^d	439	60	2,559	1,976	900	5,934
1985 ^d	369	34	2,543	3,421	644	7,011
1986 ^d	579	253	972	5,226	588	7,619
1987 ^d	436	370	960	8,021	857	10,644
1988 ^d	148	122	702	8,757	739	10,468
1989 ^d	204	56	119	4,406	703	5,488
LOUISIANA REGULATIONS ENACTED (10/89)						
1990 ^d	48	56	217	2,876	635	3,832
1991 ^d	49	22	21	1,914	460	2,125
1992 ^d	49	37	13	3,014	846	3,959
1993 ^d	49	66	24	3,178	826	4,144
1994 ^d	48	56	57	3,739	1,822	5,722
1995 ^{d*}	26	57	36	2,999	2,904	6,023
1996 ^{d*}	6	40	97	1,619	4,253	6,015
1997 ^{d*}	7	120	26	1,643	2,775	4,571

* Preliminary

Fla. (West Coast)

^aSummarized in Pearson (1929)

^bSummarized in Simmons and Breuer (1962)

^cBureau of Commercial Fisheries

^dNational Marine Fisheries Service

Table 3.3. Number of commercial La. gear licenses and percent of black drum catch by gear type. Resident licenses only.

Year	Haul Seine	Trawl	Trammel Net	Line	Purse Seine	** Gill Net	Rod Reel
1984	609 2.7%	17,843 5.49%	414 4.46%	N/A 3.8%	33 30.1%	2,252 43.4%	N/A
1985	442 19.4%	15,927 4.7%	423 9.9%	N/A 0.8%	34 23.4%	2,031 31.8%	N/A
1986	345 11.0%	16,311 16.3%	377 11.0%	N/A 2.7%	26 5.3%	2,118 56.5%	N/A
1987	281 4.0%	24,358 17.8%	826 9.7%	N/A 9.5%	N/A 2.6%	3,271 56.5%	N/A
1988	236 4.2%	20,578 10.7%	605 2.4%	N/A 2.6%	N/A 6.7%	2,476 73.4%	N/A
1989	265 0.7%	18,270 13.0%	619 2.5%	180 0.3%	N/A 0.0%	2,717 85.6%	N/A
1990	257	16,735	594	1,055	- -	2,565	N/A
1991	249	14,959	536	1,012	- -	2,645	N/A
1992	218	13,866	493	995	- -	831	N/A
1993	184	11,349	486	1,016	- -	900	N/A
1994	196	10,231	489	1,053	- -	1,020	N/A
1995	162	10,064	467	1,170	- -	781 ** 755/ 34	3
1996	0	9,847	0	1,369	- -	** 847/134	24
1997	0	9,048	0	1,456	- -	** 707/ 87	25
1998*	0	9,182	0	1,455	- -	@ 385/	48

LDWF, Commercial Licenses

*PRELIMINARY (through December, 1998)

N/A-Not available

**Mullet strike net/Pompano strike net substituted for SW Gill net license, winter of 1995

@ gear no longer allowed for black drum capture

Table 3.4 .Historical Landings and Value of Commercial Black Drum fishery Louisiana, 1970-1995.

Year	Pounds (x1000)	Value (dollars)	Deflated value * (dollars)	Price (\$/lb)	Louisiana	
					Deflated price* (\$/lb)	share of Gulf landing (percent)
1970	434	32,644	84,134	0.08	0.19	32.3
1971	506	35,775	88,333	0.07	0.17	28.6
1972	540	38,467	92,026	0.07	0.17	28.9
1973	541	44,887	101,097	0.08	0.19	28.1
1974	440	41,630	84,442	0.09	0.19	22.9
1975	276	29,048	53,993	0.11	0.20	18.1
1976	579	68,711	120,757	0.12	0.21	20.9
1977	583	81,798	134,980	0.14	0.23	27.4
1978	580	116,354	178,457	0.20	0.31	20.6
1979	536	98,661	135,897	0.18	0.25	12.6
1980	472	92,910	112,755	0.20	0.24	8.0
1981	2,889	612,204	673,492	0.21	0.23	44.4
1982	1,691	572,882	593,660	0.34	0.35	39.7
1983	1,859	703,453	706,278	0.38	0.38	35.3
1984	1,976	1,042,759	1,003,618	0.53	0.51	33.3
1985	3,421	1,018,687	946,735	0.30	0.28	48.8
1986	5,226	1,836,930	1,676,031	0.35	0.32	68.6
1987	8,021	2,640,319	2,350,633	0.33	0.29	75.4
1988	8,757	2,347,834	1,987,644	0.27	0.23	83.7
1989	4,406	1,831,962	1,477,389	0.42	0.34	80.3
1990	2,876	1,115,212	853,261	0.39	0.30	75.1
1991	1,914	1,170,134	859,129	0.61	0.45	90.1
1992	3,014	1,428,767	1,018,366	0.47	0.34	76.1
1993	3,178	1,985,349	1,355,259	0.62	0.43	76.7
1994	3,739	2,531,907	1,708,439	0.68	0.46	65.3
1995	2,999	2,332,328	1,540,507	0.79	0.52	49.8

* Adjusted by the consumer price index with 1982-84 = 100 as the base year.

Sources: Leard et al. 1993, NMFS Commercial Landings Database, and U.S. Department of Commerce 1994.

Table 3.5. Exvessel prices of black drum by size groups.
(dollars per pound)

Year	2-5 lbs. small	6-10 lbs. medium	10+ lbs. bull*
1988	\$0.70-1.40	\$0.30-0.70	\$0.08-0.18
1989	\$0.60-1.15	\$0.44-0.65	\$0.08-0.17
1990	\$0.80-1.80	\$0.60-1.00	\$0.08-0.27
1991	\$1.00-1.90	\$0.55-1.20	\$0.08-0.33
1992	\$0.50-1.20	\$0.33-0.75	\$0.07-0.33
1993	\$0.30-1.60	\$0.13-0.75	\$0.08-0.33
1994	\$0.40-1.70	\$0.20-0.65	\$0.10-0.33
1995	\$0.40-1.60	\$0.20-1.25	\$0.10-0.27
1996	\$0.30-1.60	\$0.30-1.00	\$0.13-0.33
1997	\$0.40-1.60	NA	\$0.10-0.30

*based on 15 pound fish for bull drum.

Table 3.6 Summary of recreational fishing statistics for black drum in the Gulf of Mexico.
(updated from Sutter *et al.* 1986). ^a

YEAR	Total U.S. catch (thousands of fish)	U.S. catch from Gulf of Mexico (thousands of fish)	Percent of Gulf catch by Gulf State					Estimated Gulf catch by fishing mode (thousands of fish)			
			FL	AL	MS	LA	TX	Shore	Party/ Charter	Rental/ private	Total
1979-	2,665	2,245 (84.2%)	3.3	--	--	39.8	56.3	267	--	1,978	2,245
1981-	1,713	1,638 (95.6%)	5.6	--	3.0	14.6	76.3	1013	--	625	1,638
1982-	1,704	1,505 (88.3%)	11.4	--	--	60.8	26.6	633	--	871	1,505
1983-	1,709	1,461 (85.5%)	7.0	--	2.1	81.9	8.7	503	--	1,059	1,461
1984-	1,116	785 (70.3%)	28.7	--	--	48.7	22.0	278	--	496	785
1985-	1,362	1,089 (80.0%)	19.3	--	--	39.8	39.9	510	--	556	1,089
1986-	1,867	1,430 (76.6%)	17.2	--	--	80.8	N/A	396	--	1,032	1,430
1987-	1,716	1,303 (75.9%)	45.3	--	3.1	50.7	N/A	617	--	685	1,303
1988-	1,586	1,344 (84.7%)	22.1	2.2	--	73.4	N/A	495	--	833	1,344
1989-	736	622 (84.5%)	40.4	1.2	5.1	53.3	N/A	168	10	444	622
1990-	818	680 (83.1%)	19.0	18.3	2.3	60.5	N/A	111	13	557	680
1991-	1,024	671 (65.5%)	34.1	1.0	6.1	58.8	N/A	255	8	408	671
1992-	1,405	1,130 (80.4%)	32.8	3.2	9.4	54.4	N/A	419	15	695	1,130
1993-	1,534	1,268 (82.7%)	18.2	2.9	1.4	77.4	N/A	601	19	648	1,268
1994-	1,125	824 (73.2%)	26.2	2.3	5.9	65.6	N/A	349	29	446	824
1995-	1,595	1,063 (66.6%)	19.0	2.2	2.3	76.5	N/A	239	34	789	1,063
1996-	1,196	818 (68.5%)	10.4	1.1	4.0	84.6	N/A	242	26	551	818
1997-	1,709	1,375 (80.5%)	7.4	2.1	4.4	86.1	N/A	351	41	983	1,375

- U.S. National Marine Fisheries Service, MRFSS reports (1980 through 1990)

- U.S. National Marine Fisheries Service, Fisheries Statistics & Economics Division Website

^a Note: Texas recreational landings are not available through MRFSS though they have historically made up a significant percentage of the Gulf States' black drum landings.

Table 3.7 Historical data on recreational black drum and all saltwater species caught, Louisiana 1981 - 1997.

Year	Number of Black Drum caught	Number of Black Drum harvested	Percent released	Percent of total catch	Percent of total harvest	Average weight of black drum harvested (lbs)	Average weight of all species harvested (lbs)
1981	264,093	192,248	27.2	2.2	2.7	2.9	1.8
1982	1,360,949	858,953	36.9	2.8	3.6	2.1	1
1983	1,284,201	916,554	28.6	2.4	2.8	2.9	1
1984	402,938	219,296	45.6	2.4	2.9	4.1	1.5
1985	451,059	265,600	41.1	1.9	2.6	2.2	1.2
1986	1,136,489	802,722	29.4	2.2	2.8	2.9	0.8
1987	636,858	417,121	34.5	2.1	2.7	6.5	1.1
1988	796,796	449,683	43.6	2.1	3.5	3	1.3
1989	331,994	195,888	41	1.4	2.6	4.6	1.9
1990	411,352	131,011	68.2	1.5	1.6	3.2	1.4
1991	394,717	110,603	72	1.1	0.9	4.9	1.5
1992	615,494	208,533	66.1	1.9	1.5	4	1.4
1993	981,644	236,800	75.9	3	1.6	3	1.4
1994	540,268	141,806	73.8	1.8	1	4.6	1.4
1995	812,533	231,350	71.5	2.7	1.7	3.4	1.8
1996	691,718	300,189	56.6	2.8	2.5	3	1.9
1997	1,183,830	352,114	70.3	3.8	2.7	3.9	1.8
Source: Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts 1981-1997,							
National Marine Fisheries Service, Fisheries Statistics Division.							

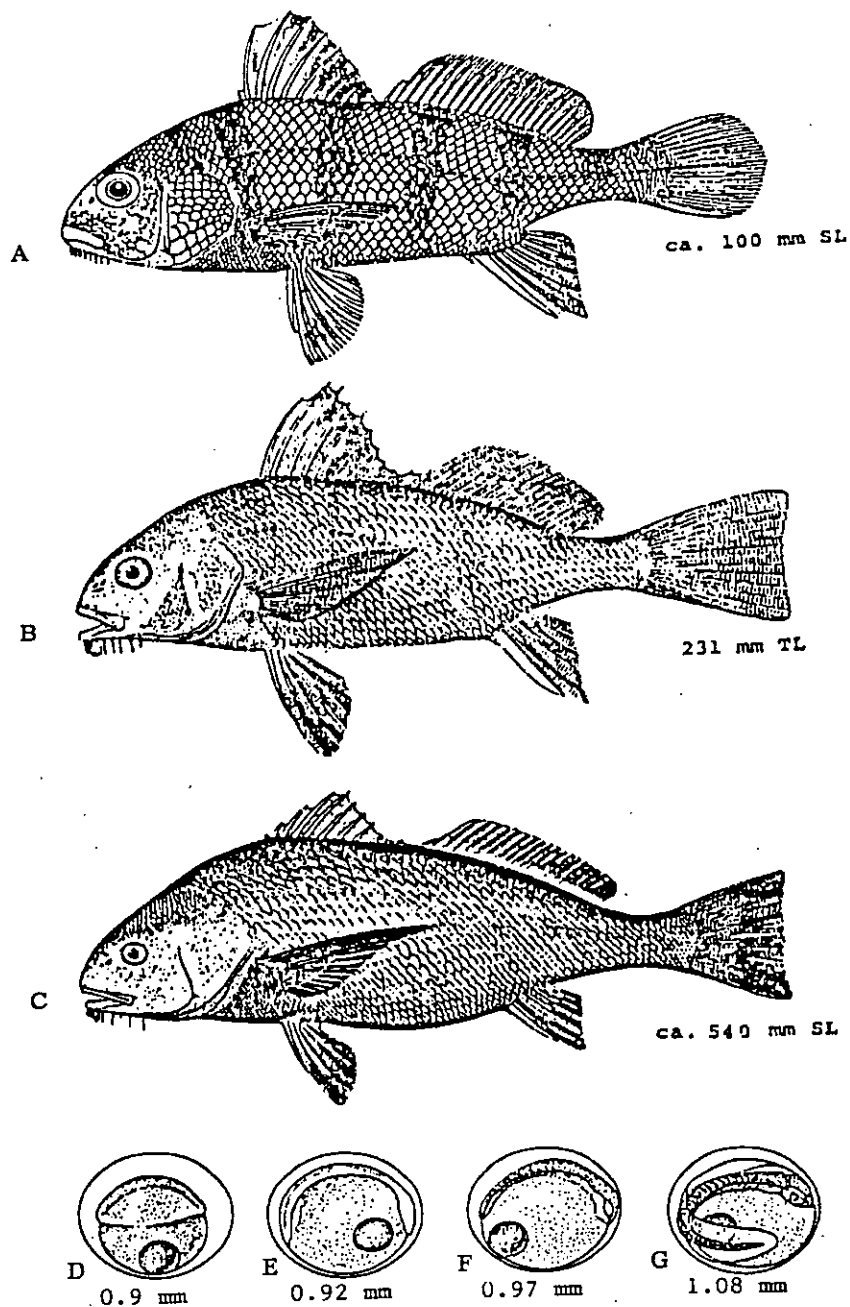


Figure 1. *Pogonias cromis*, Black drum. A. Juvenile, ca. 100 mm SL. B. Juvenile, 231 mm TL. C. Adult, ca. 540 mm SL. D.-G. Eggs in various stages of development. (A, Fowler, H. W., 1945: fig. 282. B-C, Goode, G. B., 1884: pl. 121-122. D-G, Joseph, E. B., et al., 1964: fig. 1.)

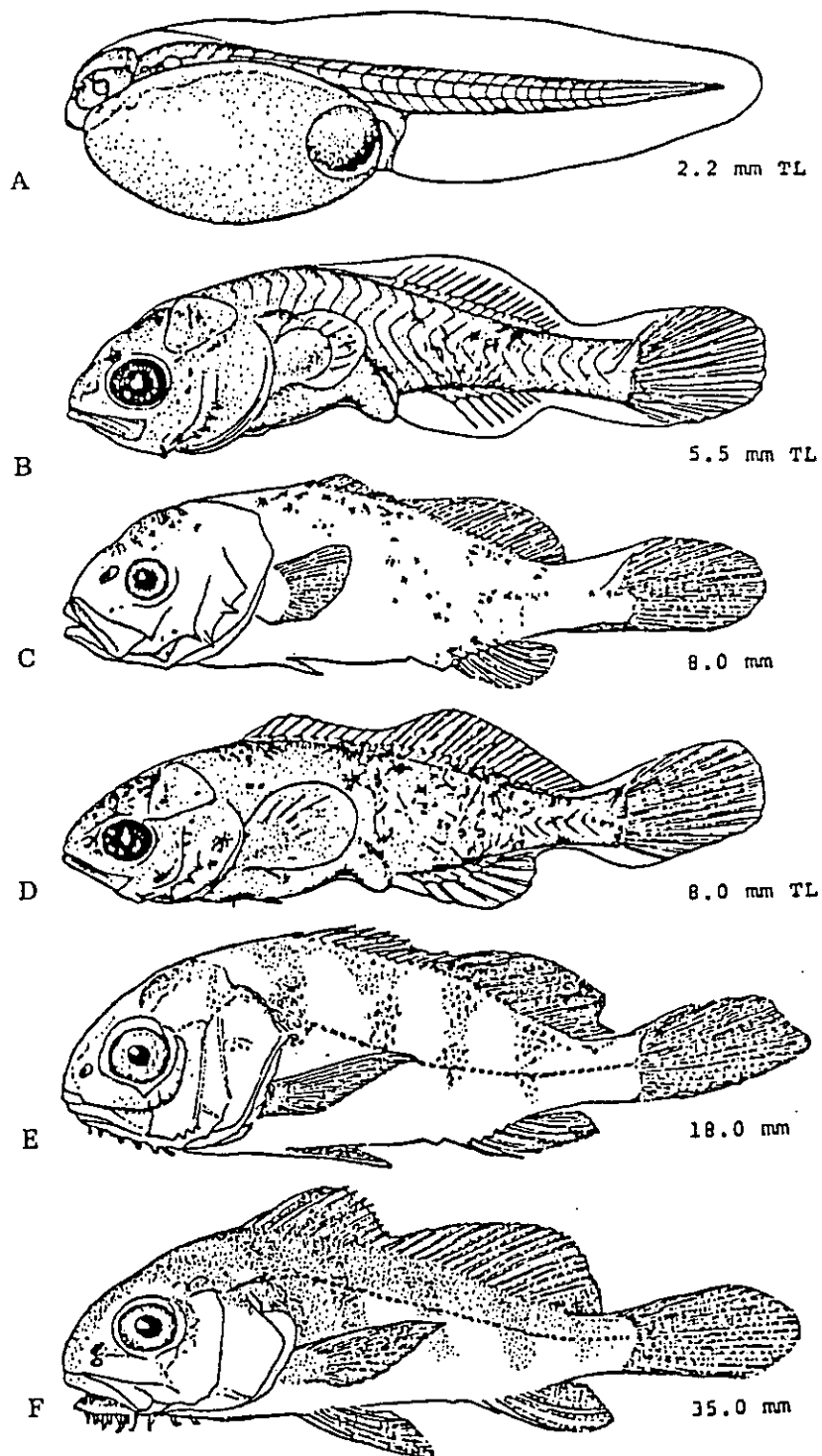


Figure 2. *Pogonias cromis*, Black drum. A. Yolk-sac larva, 2.2 mm TL. B. Larva, 5.5 mm TL. C. Larva, 8.0 mm. D. Larva, 8.0 mm TL. E. Juvenile, 18.0 mm. F. Juvenile, 35.0 mm. (A, B, D, Joseph, E. B., et al., 1964: figs. 2-3. C, E, F, Pearson, J. C., 1929: figs. 15-17.)

von Bertalanffy model with sloped asymptote

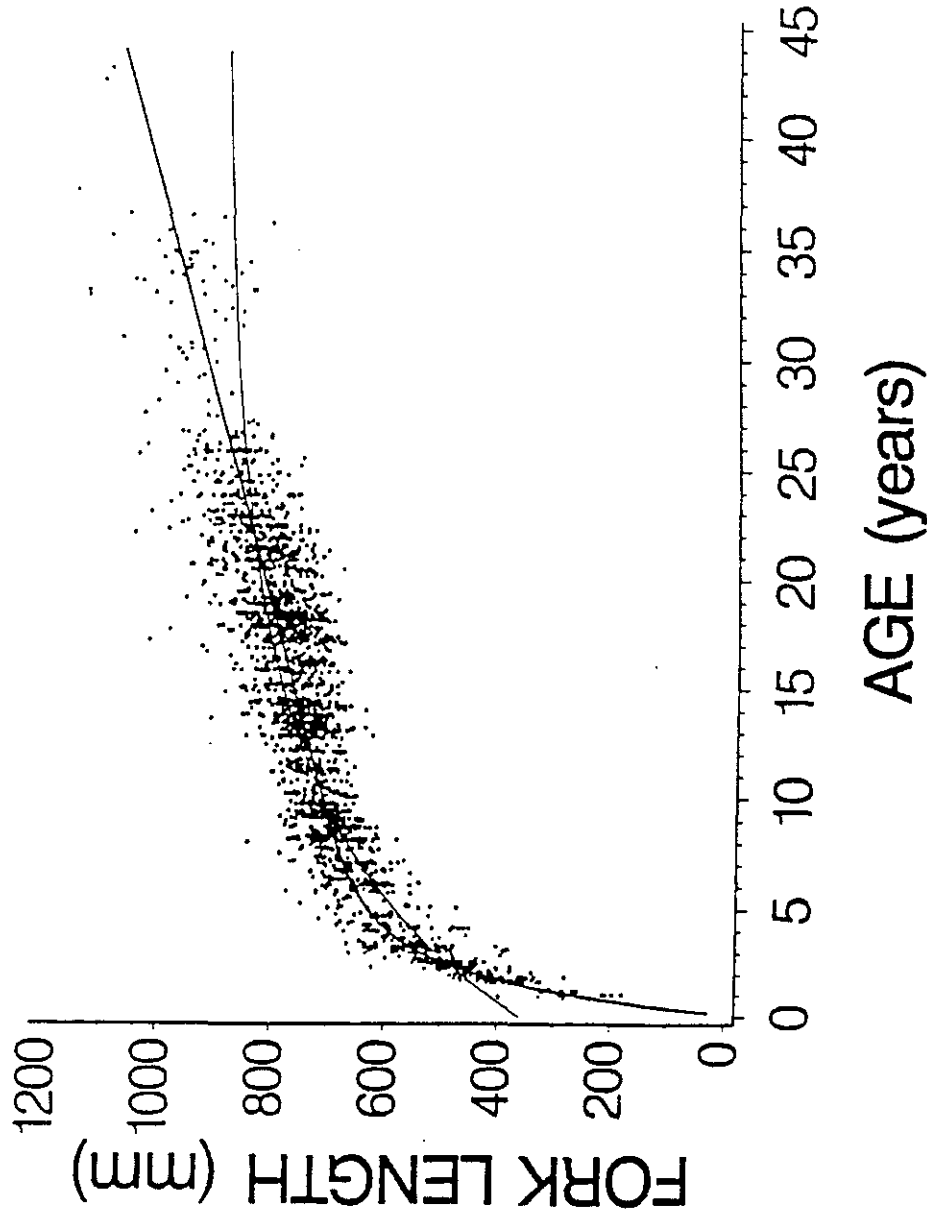


Figure 5. Fit to black drum of a von Bertalanffy growth model with sloped asymptote (bold line), compared with fit to traditional von Bertalanffy model. (from Geaghan and Garson (unpubl. 1989).

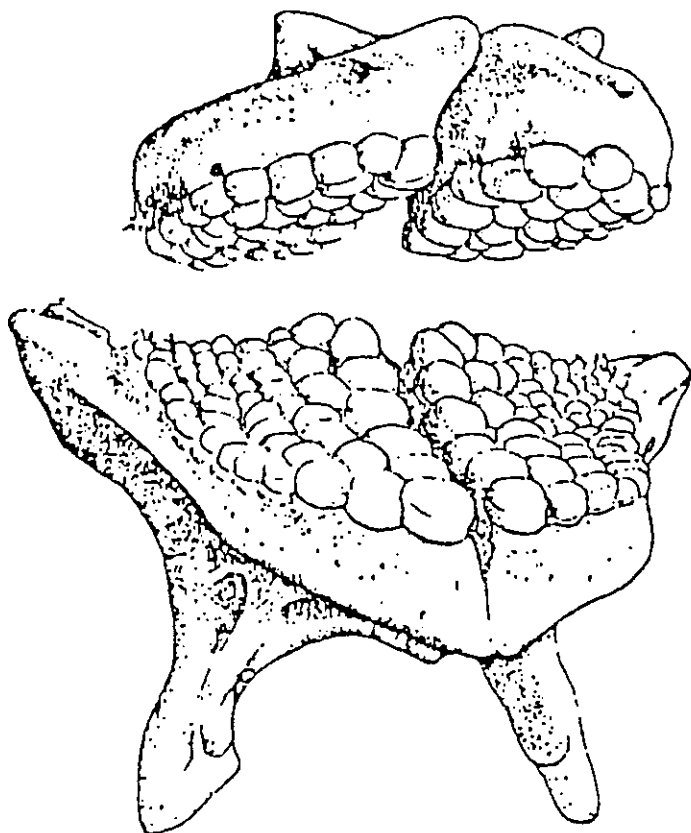
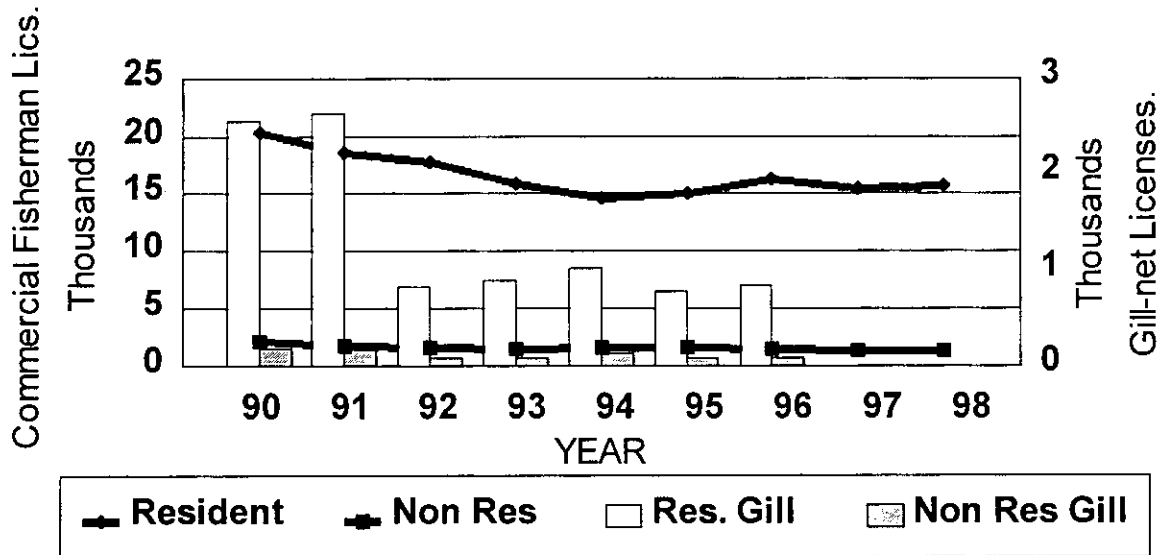


Figure 6. Pharyngeal teeth of black drum, upper and lower.
Simmons & Breuer, 1962

Commercial Fishermen's License Sales



LDWF Commercial License Section

Figure 7. Commercial Fishermen's Licenses Sold (class 11 & 31).

Note: -change in gill net licensing after 1991

-set gill nets were no longer legal gear after 1995 ("pompano strike net" license allowed capture of drum with strike gill net gear until the spring of 1997).

Commercial Harvest of Black Drum in Louisiana and the U.S. Gulf of Mexico

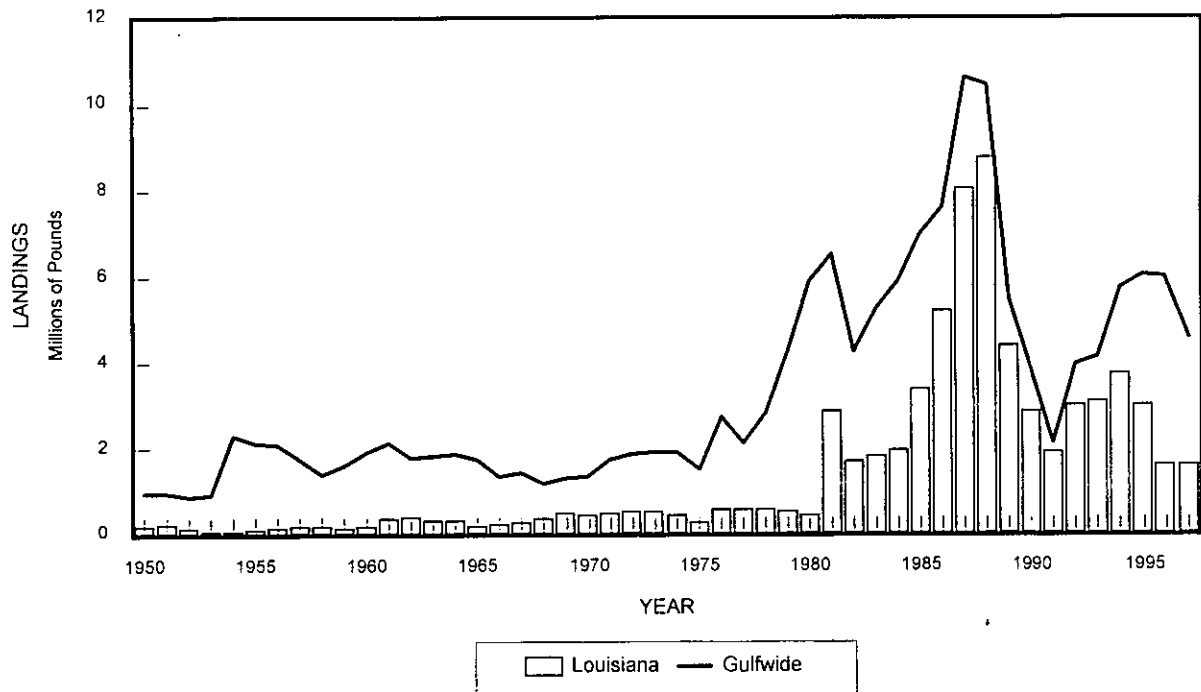


Figure 8. Black drum commercial landings from the Gulf of Mexico and Louisiana waters (NMFS landings statistics).

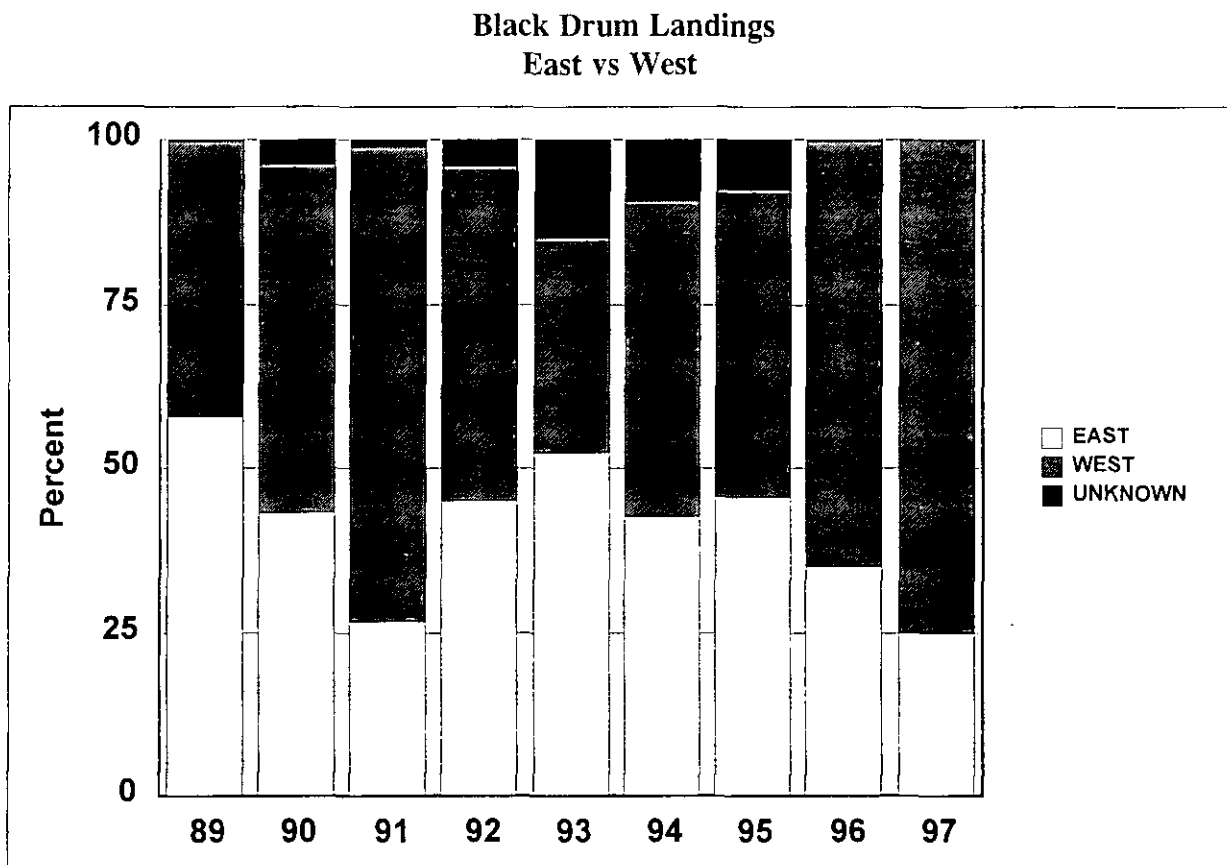


Figure 9. Location of Commercial Black Drum Harvest Across Louisiana, East or West of the Mississippi River. Unknown category could not be assigned to location. Data from NMFS and LDWF Commercial landings data files.

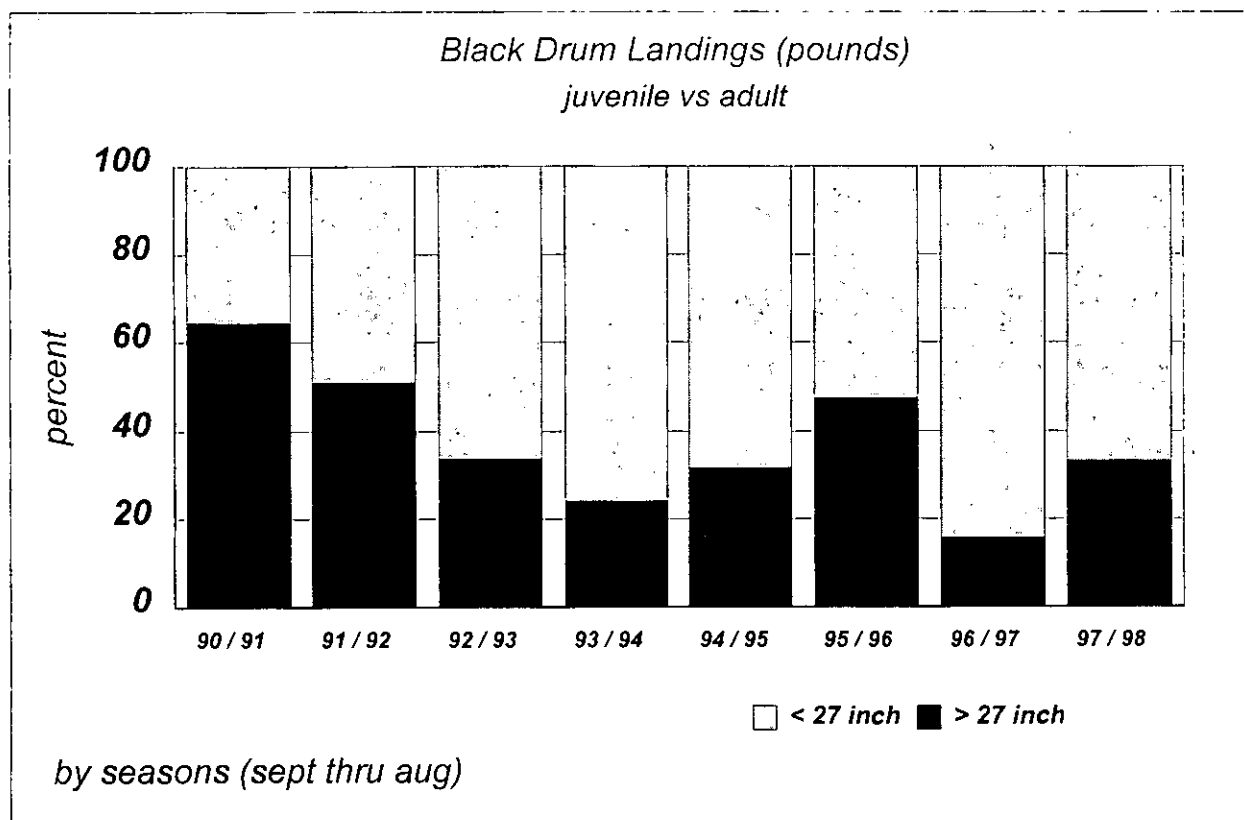


Figure 10. Percent harvest of adult ("bull", >27") and juvenile (<27") black drum in fishing seasons 1990-91 through 1997-98. Data from commercial landing reports (NMFS and LDWF data files).

Figure 11. Recreational Landings of Black Drum in Louisiana. MRFSS, NMFS data files

Year	Harvest	Released	Total Catch	Total Wgt	Avg. Wgt.	% Released
79	1,299,909	298,743	1,598,652	2,396,002	1.84	18.7%
80	725,760	250,994	976,754	1,817,753	2.50	25.7%
81	192,248	71,845	264,093	559,457	2.91	27.2%
82	858,953	501,996	1,360,949	1,832,226	2.13	36.9%
83	916,554	367,647	1,284,201	2,676,410	2.92	28.6%
84	219,296	183,642	402,938	892,317	4.07	45.6%
85	265,600	185,459	451,059	594,275	2.24	41.1%
86	802,722	333,767	1,136,489	2,367,029	2.95	29.4%
87	417,121	219,737	636,858	2,726,116	6.54	34.5%
88	449,683	347,113	796,796	1,359,815	3.02	43.6%
END PRE-REGULATION PERIOD						
PRE-REG AVG	614,785	276,094	890,879	1,722,140	2.80	31.0%
89	195,888	136,106	331,994	897,782	4.58	41.0%
90	131,011	280,341	411,352	421,108	3.21	68.2%
91	110,603	284,114	394,717	537,419	4.86	72.0%
92	208,533	406,961	615,494	824,182	3.95	66.1%
93	236,800	744,844	981,644	709,203	2.99	75.9%
94	141,806	398,462	540,268	649,263	4.58	73.8%
95	231,350	581,183	812,533	781,129	3.38	71.5%
96	300,189	391,529	691,718	902,081	3.01	56.6%
97	352,114	831,716	1,183,830	1,371,127	3.89	70.3%
POST-REG AVG	212,033	450,584	662,617	788,143	3.83	66.2%

Louisiana Recreational Drum Landings

Numbers and Pounds of Fish

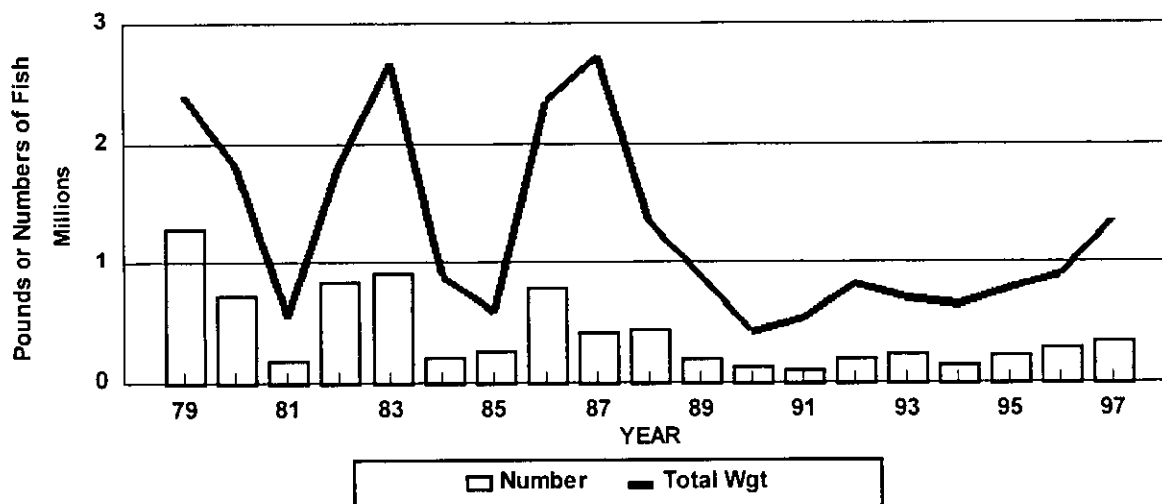


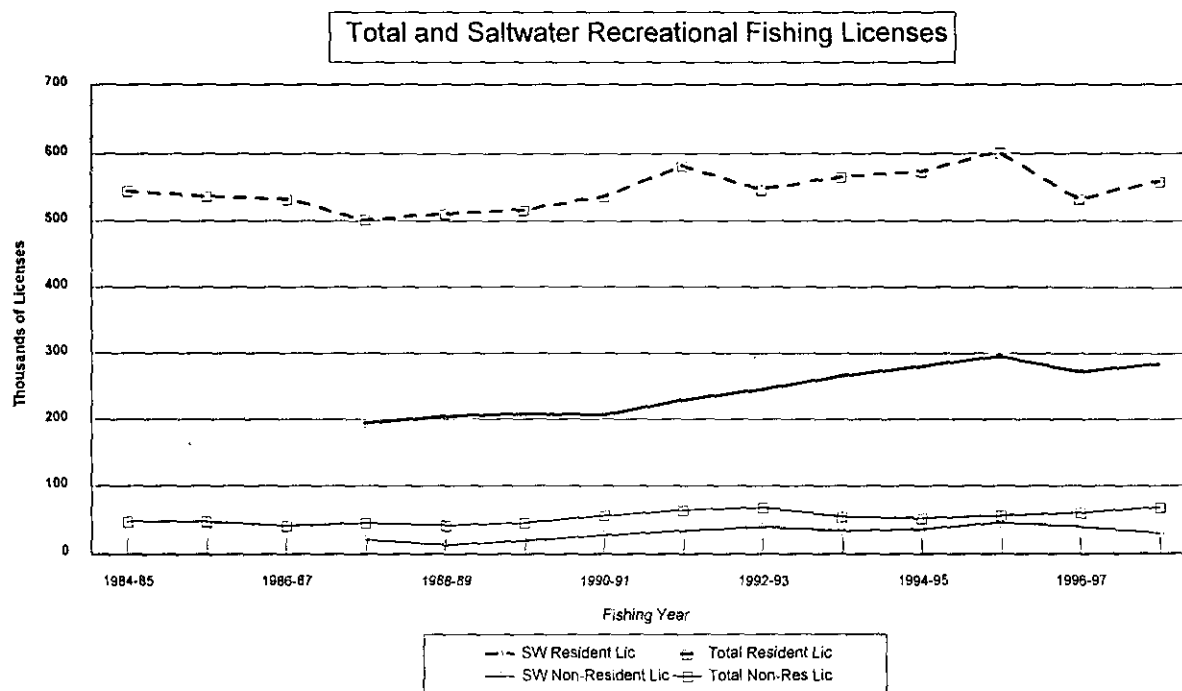
Figure 12. Total fishing licenses, resident, and non-resident saltwater fishing licenses (LDWF Sports License Section) and estimated numbers of saltwater anglers from the NMFS MRFSS telephone survey. MRFSS estimates include non-licensed anglers (<16 or >59 years of age). "Total" licenses includes freshwater fishing categories, Saltwater licenses are required in addition to the basic freshwater license.

Saltwater recreational fishing license sales vs. estimated numbers of saltwater anglers.

SEASON	NUMBER SOLD		RESIDENT* S.W. ANGLERS
	RESIDENT	NONRESIDENT	
1984-1985	102,125		421,418
1985-1986	169,149		584,246
1986-1987	198,852		633,286
1987-1988	195,099	20,627	557,926
1988-1989	204,686	14,107	456,631
1989-1990	208,292	19,396	349,313
1990-1991	206,088	27,758	363,147
1991-1992	229,805	33,587	428,818
1992-1993	245,952	39,591	386,330
1993-1994	265,759	33,896	394,080
1994-1995	280,360	35,397	364,486
1995-1996	296,959	46,233	422,538
1996-1997	270,940	28,327**	385,297
1997-1998	284,198	29,207	464,232

*source: MRFSS, NMFS

** previous years included approximately 25% freshwater (FW) fishermen.



RESOLUTION

1999 Offshore Shrimp Season Closure adopted by the Louisiana Wildlife and Fisheries Commission

WHEREAS, R.S. 56:497 provides the open shrimp seasons for all or part of the state waters shall be fixed by the Commission, and

WHEREAS, R.S. 56:497 provides the Commission shall have the authority to set special seasons for all or part of the state waters, and

WHEREAS, R.S. 56:498 provides the minimum legal count on white shrimp is 100 (whole shrimp) count per pound, except during the time period from October fifteenth through the third Monday in December when there shall be no count, and

WHEREAS, in the State's Territorial Waters, water temperatures are below 20 degrees Centigrade and the growth rate of white shrimp is therefore slow, and

WHEREAS, current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in a portion of the State's Territorial Waters do not average 100 count minimum size or larger and are present in significant numbers, now

THEREFORE BE IT RESOLVED, the Wildlife and Fisheries Commission does hereby order a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel Buoy Line to the eastern shore of Freshwater Bayou, at 6:01 a.m. on Monday, February 8, 1999.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary.

BE IT FURTHER RESOLVED, the Wildlife and Fisheries Commission does hereby authorize the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

BE IT FURTHER RESOLVED, the Declaration of Emergency closing the State's Territorial Waters is attached to and made a part of this resolution.

Bill A. Busbice, Jr., Chairman
Wildlife and Fisheries
Commission

James H. Jenkins, Jr., Secretary
Department of Wildlife and
Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

In accordance with the emergency provisions of R.S. 49:953(B) and R.S. 49:967 of the Administrative Procedure Act which allows the Wildlife and Fisheries Commission to use emergency procedures to set shrimp seasons, and R.S. 56:497 which provides that the Wildlife and Fisheries Commission shall have the authority to open or close the State's offshore waters to shrimping, the Wildlife and Fisheries Commission hereby orders a closure to shrimping in that portion of the State's Territorial Waters, south of the Inside/Outside Shrimp Line as described in R.S. 56:495, from the Atchafalaya River Ship Channel at Eugene Island as delineated by the River Channel buoy line to the eastern shore of Freshwater Bayou. This closure is effective at 6:01 a.m., Monday, February 8, 1999.

R.S. 56:498 provides that the minimum legal count on white shrimp is 100 (whole shrimp) count per pound after the third Monday in December. Current biological sampling conducted by the Department of Wildlife and Fisheries has indicated that white shrimp in this portion of the State's outside waters do not average 100 count minimum legal size or larger and are present in significant numbers. This action is being taken to protect these small white shrimp and allow them the opportunity to grow to a more valuable size.

The Wildlife and Fisheries Commission authorizes the Secretary of the Department of Wildlife and Fisheries to close to shrimping, if necessary to protect small white shrimp, any part of the

remaining Territorial Waters, if biological and technical data indicates the need to do so, and to reopen any area closed to shrimping when the closure is no longer necessary; and hereby authorizes the Secretary of the Department of Wildlife and Fisheries to open special seasons for the harvest of white shrimp in any portion of the State's inshore waters where such a season would not detrimentally impact small brown shrimp.

Bill A. Busbice, Jr.

Chairman

RESOLUTION

Bay Junop Oyster Seed Reservation Season Extension
February 4, 1999

Louisiana Wildlife and Fisheries Commission
Louisiana Department of Wildlife and Fisheries

WHEREAS, the Louisiana Wildlife and Fisheries Commission set the 1998/1999 oyster season to run from September 9, 1998 to April 1, 1999 at its August 1998 meeting with the exception of Calcasieu Oyster Tong Area, and

WHEREAS, R.S. 56:433 B(1) allows for Commission consideration of an extension to May 15th of the oyster season, and

WHEREAS, virtually all of the Bay Junop Oyster Seed Reservation was closed by the State Health Department during the 1998/1999 oyster season, and

WHEREAS, the Health Department has indicated that the entire Bay Junop Oyster Seed Reservation will meet the harvesting criteria in May.

THEREFORE BE IT RESOLVED, the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999, and

BE IT FURTHER RESOLVED, that the remaining public oyster grounds will close as previously scheduled.

Bill A. Busbice, Jr.
Chairman, La. Wildlife and
Fisheries Commission

James H. Jenkins, Jr.
Secretary, La. Department of
Wildlife and Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the emergency provisions of the Administrative Procedure Act, R.S. 49:953(B) and 967, and under the authority of R.S. 56:433 and R.S. 56:434, notice is hereby given that the Secretary of the Department of Wildlife and Fisheries and the Wildlife and Fisheries Commission hereby declare:

That the Bay Junop Oyster Seed Reservation will remain open for oyster harvest until one-half hour after sunset on May 15, 1999.

Bill A. Busbice, Jr.

Chairman

RULE

Department of Wildlife and Fisheries Wildlife and Fisheries Commission

The Wildlife and Fisheries Commission does hereby amend LAC 76:I.301 regulating seismic exploration and repeal LAC 76:I.303 on permits. Authority for adoption of this Rule is included in R.S. 30:214 and R.S. 36:609. This notice is given pursuant to the Administrative Procedure Act, R.S. 49:950 et seq.

Title 76

WILDLIFE AND FISHERIES

Part I. Wildlife and Fisheries Commission and Agencies Thereunder

Chapter 3. Special Powers and Duties

Subchapter A. Seismic Exploration

§301. Regulations

A. Definitions

Cultivation--any human activity the purpose of which is to enhance the production of oysters.

Oyster Areas--those areas of coastal Louisiana which are capable of supporting natural or cultivated oyster populations.

Oyster Bed--an oyster reef or a waterbottom on which oysters are actively being cultivated.

Oyster Reef--a discrete, clearly distinguishable structure which:

1. has been formed primarily by living oysters and other organisms;
2. is not necessarily currently supporting live oysters;

3. at least a portion of which must be above the mud line, (i.e. not covered by mud or silt); and

4. may support live oysters as a result of normal hydrological fluctuations.

B. In order to protect, conserve, and replenish the wildlife of the state of Louisiana, including all aquatic life, and pursuant to the authority conferred by Article IX, Section 7 of the Louisiana Constitution of 1974, R.S. 30:214 et seq. and R.S. 36:609; the following rules shall from and after promulgation date, govern any exploration work involving the discharge of explosives and other energy sources in the state of Louisiana for geophysical exploration.

1. The Wildlife and Fisheries Commission, pursuant to its constitutional and statutory authority, hereby designates how geophysical exploration work shall be conducted insofar as it relates to the fish, seafood, aquatic life, oysters, wildlife and waterbottoms of the state. No geophysical exploration work shall commence without the approval of the Secretary of the Department or his designee. The Department of Wildlife and Fisheries, Marine Fisheries Division, Seismic Section is hereby authorized and directed to enforce and administer these regulations with full power and authority to take all appropriate actions to ensure proper administration and compliance.

2. Application(s) for permission to operate shall be made by letter giving the names of the parishes where the geophysical exploration is to be conducted. Written permission to operate shall be valid for a period of one year from date of

approval, unless otherwise specified. In order to obtain and maintain permission to operate, an applicant shall furnish the Department a surety bond in the amount of \$75,000 from a bonding company licensed to do business in the state of Louisiana and to whom A.M. Best and Company has given an "B+/7" or better rating. Bond forms may be obtained from the Seismic Section. The bond shall be filed by the applicant prior to issuance of any permission to operate. Said bond shall guarantee payment of all shot hole fees and mileage fees, inspector fees, all compensation for damage to public lands, and waterbottoms (including, without limitation, damages for failure to remove equipment and trash), oysters, fish and other aquatic life, and/or other natural resources, man-made canals, bulkheads, rights-of-way and structures for which said applicant may be legally liable, and which may be suffered by the state of Louisiana. The bond shall also guarantee any and all fees in whole and in part for services rendered by the Department and its offices in accordance with regulations of the Department of Wildlife and Fisheries or the Wildlife and Fisheries Commission and all applicable penalties, and any other liabilities to the state of Louisiana incurred by the applicant during the geophysical operations. Applicants must also supply the Seismic Section with proof of general liability insurance in the amount of \$1,000,000. The policy must be issued by an insurer approved by the Department, and specifically cover all damage to land, waterbottoms, oysters, fish and other aquatic life, or other natural resources, man-made canals, bulkheads, rights-of-way, and other structures for which Permittee may be legally liable. In addition, Permittees applying

for a renewal of the letter of permission to operate must have demonstrated a record of sound business practices by making timely payments of seismic fees to the Department, and by being in complete compliance with the Department's regulations including those regulations requiring notifications and timely submission of seismic exploration data daily reports.

3. a. The Department may, after ten working days written notice to Permittee, suspend or cancel the seismic letter of permission to operate granted pursuant hereto for failure by the Permittee, to make timely payment to the Department for obligations owed to the state of Louisiana for the following:

i. any adjusted shot hole fees and mileage fees;

ii. any compensation for damage to public lands, waterbottoms, oysters, fish and other aquatic life, or other natural resources, man-made canals, bulkheads, rights-of-way and structures for which said Permittee may be legally liable;

iii. any fees for services rendered by LDWF personnel in overseeing geophysical exploration; and

iv. any applicable penalties.

b. The Permittee shall be entitled to a hearing upon written request, made within the 10 working day notice period, to the Secretary or his designee, to review the circumstances prompting the Department to suspend or cancel his letter of permission to operate. This hearing shall be held as soon as practicable.

4. Permittees shall submit a 1:24,000 scale map

showing, at a minimum, the outline of the project for comparison with Department databases of threatened, endangered, or sensitive wildlife and fisheries resources and a similar map on an 8.5" x 11" page. Permittees shall notify the Seismic Section before beginning any geophysical exploration on a "Notification of Beginning of Seismic Operations" furnished by the Seismic Section. The Permittee shall provide the Department with the names and telephone numbers of appropriate designated contact persons. The "Notification of Beginning of Seismic Operations" shall be accompanied by a map on an 8.5" x 11" page showing the outline of the project or line. The Permittee also shall furnish the Seismic Section with a certified copy of the information filed with the appropriate parish clerk of court in accordance with R.S. 30:217. The Permittee shall submit notification to the Seismic Section of interruption or cessation of work. If a change in the prospect or line is necessary, the Permittee will provide a new plat indicating the change. If a change on the prospect or line affects different properties, or leasehold interests, the Permittee will provide a new plat indicating the new prospect or line, and no work will begin until this change has been furnished to the Seismic Section and the Seismic Section has reviewed it with regard to threatened, endangered, or sensitive wildlife and fisheries resources. The granting of permission to operate does not give the Permittee the right to trespass on, or conduct activities on private properties, nor does it relieve the Permittee of the responsibility for damages to private property.

5. A Permittee shall organize a pre-project meeting

with the appropriate government agencies, property owners, lessees, residents, and other interested parties in the area of the proposed project. Notice of the meeting shall be advertised in the newspapers or journals designated for legal notices in the geographic areas in which geophysical survey operations are to be conducted. Additional notices should be posted in or on appropriate public places in the area of operations. All such notices shall be issued at a reasonable time before the scheduled meeting and before commencement of geophysical operations. Maps, as provided to the Seismic Section in connection with the Notification of Beginning of Seismic Operations and information designating the Permittee's contact persons during the geophysical operations, shall be made available to the public for review at this meeting.

C. Each geophysical exploration crew working in the state of Louisiana shall always be under the supervision of the Seismic Section. A Seismic Inspector may be present during the shooting operations of the Permittee to which he or she is assigned.

1. The Seismic Section representative shall have access to all records, including without limitation, shot point location maps, and shooters' logs and tracings, but only to the extent necessary to determine compliance with these regulations. Any and all proprietary or confidential information viewed or obtained by any Seismic Section representative or Seismic Inspector shall be maintained in strict confidence as mandated for disclosures of seismic data under R.S. 30:215. No Permittee shall be required to submit to the Department any document or thing containing such

confidential, proprietary information, if such document would, thereby, become a public record.

2. The party chief or party manager shall instruct the members of his party as to the requirements of these rules and regulations, and to the duty and authority of the Seismic Section and the Seismic Inspector.

3. The party chief or party manager shall furnish the Seismic Section's representative with whatever reasonable and appropriate transportation is needed to allow him to visit the working areas and shall transport the Seismic Section's representative to whatever locations he or she requests. The Department acknowledges that, when the Permittee is providing transportation for the Seismic Inspector or other representative of the Department under these regulations or other applicable law, that the Permittee is fulfilling a state mandated function and shall not be responsible, in any way, for any decisions, instructions, actions, or omissions of such Seismic Inspector or other Department representative.

4. The Seismic Inspector has the right to suspend any particular operation (e.g., surveying, drilling, shooting, or picking up equipment) or any portion of an operation, if it violates the Seismic Section's rules and regulations.

a. Written notice of violations shall be provided to the Permittee's designated contact person as soon as practicable. Corrective action taken by the Permittee and approved by the Seismic Section should dissolve the order for suspension issued by the Seismic Inspector.

b. The Permittee may request a hearing from the Secretary or his designee to review the circumstances of any suspension of geophysical survey activities. This hearing shall be convened as soon as practicable, but in any event within ten working days after the written request for a hearing. The Department shall provide the Permittee with due notice and the opportunity to participate.

5. The Department recognizes that conflicts may arise from time to time between parties regarding access to and use of public waters, waterbottoms, public lands and natural resources. In the event that such conflicts cannot be otherwise resolved, the Department may, at the discretion of the Secretary or his designee, restrict, regulate, or suspend such potentially or actually conflicting activities as may be necessary to provide reasonable and safe access to said public resources. The Department shall provide the Permittee's designated contact person at least five working days written notice prior to any suspension, restriction, or regulation of geophysical survey operations due to user conflicts. The Permittee may request a hearing from the Secretary or his designee to review the circumstances of the Department's restriction, regulation or suspension of geophysical activities. This hearing shall be convened as soon as practicable, but at any event within ten working days after written request for a hearing. The Department shall provide all interested parties with due notice and opportunity to participate.

6. No Seismic Inspector shall have the right to release any Permittee from the obligations imposed by these rules and

regulations. Variances from these regulations may be granted by the Department only after written application by the Permittee setting forth reasons therefore. The release, signed by the Secretary or his designee, will designate the particular area and rule affected, and the procedures to be followed in lieu of any established rule. The Secretary or his designee may provide this information to appropriate interested parties upon request.

D. The Permittee must make a separate report for each day, whether or not shooting is in progress. Daily reports must furnish complete information as indicated by the report form, and must be signed by the party chief or party manager.

E. No geophysical exploration work shall be conducted on any wildlife refuge, waterfowl refuge, scenic river or stream, game preserve, fish preserve or hatchery, or oyster seed ground reservation without written permission from the Department through the division in charge of such refuge, preserve, river, stream, hatchery or reservation. While operating on any wildlife refuge, waterfowl refuge, scenic river, stream, game preserve, fish preserve or hatchery or oyster seed ground or reservation, the Permittee must abide by all rules and regulations of said area, in addition to these seismic regulations to the extent they apply.

F. Boats, marsh buggies, airboats, or other types of marsh vehicles, when used, must be used so as to cause the minimum disturbance or damage to the lands, waterbottoms, and wildlife and fisheries resources thereon. When working on wildlife management areas, wildlife refuges, scenic rivers, streams, fish preserves or hatcheries, or public oyster seed grounds or reservations, the

Permittee will coordinate with the supervisor in charge of the area as to rules of the area. Rules, regulations and fees may vary from one such area to another.

G. No marsh buggies shall have contact with any oyster reef or bed, including state-owned natural reefs, nor shall any explosives or other energy sources be discharged within 250 feet of any oyster reef or bed, including any state-owned natural reefs, without permission from the lessee of the reef or bed, and the Department. The Seismic Section will review all projects in designated public oyster seed grounds and reservations.

H. Geophysical Permittees are required to furnish an oyster lease plat to each affected oyster lessee showing the proposed number of shot points on line and their proposed location. Geophysical Permittees are required to furnish notice to oyster lease applicants of the proposed crossing of waterbottoms for which said applicant has applied for an oyster lease, provided said application(s) has been plotted on the Departments map(s).

I. All pipe used in geophysical operations must be removed to at least six feet below the surface of the ground, or six feet below the bottom in water areas, before finally leaving the shotpoint. No pipes shall be left unattended on land or in water.

J. All parties using pipe in water areas must have clearly welded or stamped at each end of each joint the name or abbreviation of the name of the Permittee using the pipe. All equipment including cables, boxes, geophones, staff poles, anchors, buoys, etc., must be permanently tagged with the name of the Permittee. All 2 x 2's used for survey lines must be clearly

stamped with the name of the Permittee using the stakes at approximately three-foot intervals. These stakes must be removed immediately upon completion of the project. All cane poles must be removed immediately upon completion of the project. Anchors shall be marked, stamped, or tagged to identify the Permittee who deployed them, and shall be secured to an appropriately marked buoy, vessel, or float.

K. Permittees shall comply with the U.S. Coast Guard and/or the U.S. Army Corps of Engineers' rules and regulations for marking and lighting material and/or equipment in navigable waters. In addition, all survey buoys used in geophysical operations should be colored fluorescent green to mark receivers, and fluorescent red to mark the source line or shot line as well as show the name of the Permittee. All such floats in areas of seismic operations shall use floating line.

L. No explosives shall be discharged knowingly within 1,000 feet of a boat without notice being given to such boat so that it may move from the area.

M. Persistent gas and water discharges caused by drilling or shooting operations of seismic crews will be stopped immediately by the Permittee.

N. Explosive charges or multiple charges in the same shot hole in excess of 50 pounds shall not be used except pursuant to express written authorization from the Secretary or his designee. Requests for the use of such charges and other variances from the charge sizes, hole depths, and/or setback requirements must be made in writing, giving the reasons why such charges are needed, the

particulars of charge sizes, hole depths, patterns of deployment, and setback from potentially sensitive environments. Such requests should be addressed to the Seismic Section. Variances shall not be unreasonably withheld or delayed. All documents submitted to the Seismic Section in connection with requests for variances shall be public records; therefore, any confidential proprietary information required for review of a variance request may be submitted orally or by demonstrative presentation referenced in the written application, but the underlying confidential information shall not be disclosed in the written request filed with the Department. The Permittee may request a hearing to review all determinations, decisions, and regulations imposed with regard to requested variances, as set forth in §301.C.4.b. above. The Secretary or his designee may provide this information to appropriate interested parties upon request.

O. 1. Minimum required depth of charges shall be as follows for shots detonated in holes:

Weight of charge	Minimum required depth
1 pound or less	10 feet

Charges of 1 pound or less may only be used in upland areas. In addition, the hole must be tamped before shooting and the charge must be shot on the same day it is placed.

Between 1 pound and 2 pounds	25 feet
2 pounds up to 5 pounds	40 feet
5 pounds up to 20 pounds	60 feet
20 pounds up to 30 pounds	70 feet
30 pounds up to 40 pounds	100 feet

40 pounds up to 50 pounds

120 feet

No part of the charge shall be above minimum required depth.

2. The use of suspended charges as energy sources is prohibited unless a variance is granted by the Secretary or his designee. If permitted, the Secretary or his designee shall then set forth requirements to minimize the effect on wildlife and fisheries resources.

P. Detonation of seismic explosive charges will be allowed only during daylight hours. Variances to this rule may be requested as set forth in §301.N. Permittees shall notify the Seismic Section of 24 hour airgun operations prior to beginning such operations. The Department may, after review of the details of such night operations and areas affected thereby, impose additional restrictions, regulations or requirements upon such operations as may be reasonable and necessary for the protection of public waters, waterbottoms, lands, and wildlife. No shooting will be allowed in heavy fog. The Permittee may request a hearing to review all determinations, decisions, and regulations imposed with regard to night operations and weather conditions, as provided for in §301.C.4.b. above.

Q. In accordance with good industry practice, Permittee shall, after drilling and loading shot holes, backfill holes with cuttings or another material authorized by the Department, and place the shot hole plug near the surface to avoid wash-in.

R. All equipment including boxes, cables, staff poles, poles, anchors, etc., must be cleared from project areas before the

Permittee leaves the area. The Permittee shall confirm in writing to the Seismic Section that all its equipment, materials, and refuse have been cleared from the project area. Said letter of confirmation shall be a public record. Variances from this rule may be granted by the Department if accompanied by a written request from an affected landowner or agency. The Secretary or his designee may provide this information to appropriate interested parties upon request.

S. A fee of \$135 per day will be charged to geophysical Permittees. This fee will be reviewed each January. All payments will be made by the Permittees directly to the Department on or before the fifteenth of each month. No payments are to be made to the Seismic Inspectors. Seismic Inspectors shall make and the Seismic Section shall maintain written records of the Inspectors' work in connection with each geophysical project, identifying the date, time, location, nature of the inspector's work, and the Permittee involved.

T. Permittees making application to work on any designated oyster seed ground or reservation designated by the state of Louisiana as specified in R.S. 56:434 and 435; and LAC Title 76 will be required to pay the following fees in addition to the supervisory fees: \$100 per shot hole, or \$1,000 per linear mile, whichever is greater, for reflective or refractive cable.

Airguns Only

Water Depths	Fees (per linear mile)
Less than or equal to five feet deep	\$1,000

Greater than five feet and less than or equal to 10 feet deep	\$400
Greater than 10 feet deep	\$200

3D Airgun Surveys

Water Depths	Fees (per square mile)
Less than or equal to five feet deep	\$12,500
Greater than five feet and less than or equal to 10 feet deep	\$5,000
Greater than 10 feet deep	\$2,500

All of these fees are to be paid in advance. All fees will be reviewed each January. It is the intention of the Wildlife and Fisheries Commission and the Department to use any fees collected pursuant to this rule to plant shells for oyster cultch, to rehabilitate areas damaged by operations and as mitigation for any other damages to the coastal area.

U. All geophysical Permittees conducting operations shall exercise reasonable precaution and act in accordance with approved and accepted methods to prevent destruction of, or injury to the fish, oysters, shrimp and other aquatic life, wildlife or other living natural resources of the state of Louisiana, or their habitats.

V. Any violation of these or other rules promulgated by the Commission or the Department for the regulation of geophysical operations, or the refusal of any Permittee or its employees to comply fully with all orders and requirements which may be made by authorized personnel of the Department at the time the exploration is conducted, or any attempt to unduly influence any Seismic Inspector to abstain from the enforcement of these regulations

shall constitute cause for suspension or cancellation of the "permission to operate", cessation of all exploration work, and disqualification of the party chief, party manager, field manager, and/or the Permittee involved from future operations in this state. The Permittee may request a hearing from the Secretary or his designee to review the particular circumstances prompting the Department to suspend or cancel his letter of permission to operate per the provisions of §301.C.4.b.

W. These rules and regulations supersede all other rules and regulations issued prior to this date, and are subject to change by the Department and the Wildlife and Fisheries Commission.

AUTHORITY NOTE: Promulgated in accordance with R.S. 30:214 and R.S. 36:609.

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 4:300 (August 1978), amended LR 10:410 (May 1984), LR 13:115 (February 1987), LR 18:509 (May 1992), LR 25: (February 1999).

§303. Permits

Repealed.

AUTHORITY NOTE: Promulgated in accordance with R.S. 30:214 and R.S. 36:609.

HISTORICAL NOTE: Promulgated by the Department of Wildlife and Fisheries, Wildlife and Fisheries Commission, LR 4:300 (August 1987), amended LR 10:410 (May 1984), repealed LR 25: (February 1999).

Bill A. Busbice, Jr.

Chairman

LOUISIANA DEPARTMENT OF
WILDLIFE AND FISHERIES

STRATEGIC PLAN

1999-2000 THROUGH 2003-2004

FOREWORD

The aquatic, wildlife, and water resources of Louisiana are substantial. Hundreds of thousands of citizens depend on these resources for recreation, for livelihood, and as a source of nourishment. The resources are actively managed by the Department of Wildlife and Fisheries, and they contribute significantly to the standard of living of the state's residents and to the economic health of the state. The total value of the economic impact of recreational and commercial resource activities upon the state exceeds \$8 billion annually. This includes retail sales, jobs, and tax revenues.

According to the Louisiana Constitution and the revised statutes, the Department is vested with control and supervision of the wildlife of the state, including all aquatic life, and is authorized to execute the laws enacted for the control and supervision of programs relating to the management, protection, conservation, and replenishment of wildlife, fish, and aquatic life, and the regulation of the shipping of wildlife, fish, furs, and skins.

The Department is organized into four appropriated budget units (offices): Secretary, Management and Finance, Wildlife, and Fisheries. The Office of Secretary is comprised of four programs: Administration, Enforcement, Information and Education, and the Seafood Promotion and Marketing Board. The Office of Wildlife includes the Wildlife Division and the Fur and Refuge Division. The Natural Heritage Section and the Fur and Alligator Council are sections within the Fur and Refuge Division. The Office of Fisheries is comprised of the Inland Fisheries Division and the Marine Fisheries Division.

The Department initiated its strategic planning process in February, 1998. The functions of coordination, facilitation, and compilation were performed by existing staff within the Office of Management and Finance. All levels of program staff were involved in the process, from administrators to technical employees. A list of key persons responsible for development and final product is included as part of this plan.

While this plan meets the minimum requirements of Act 1465, the Department believes that continued development and further refinement will be necessary and will result in a more cohesive plan that can be used to give future direction programmatically and financially.

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THE PLAN

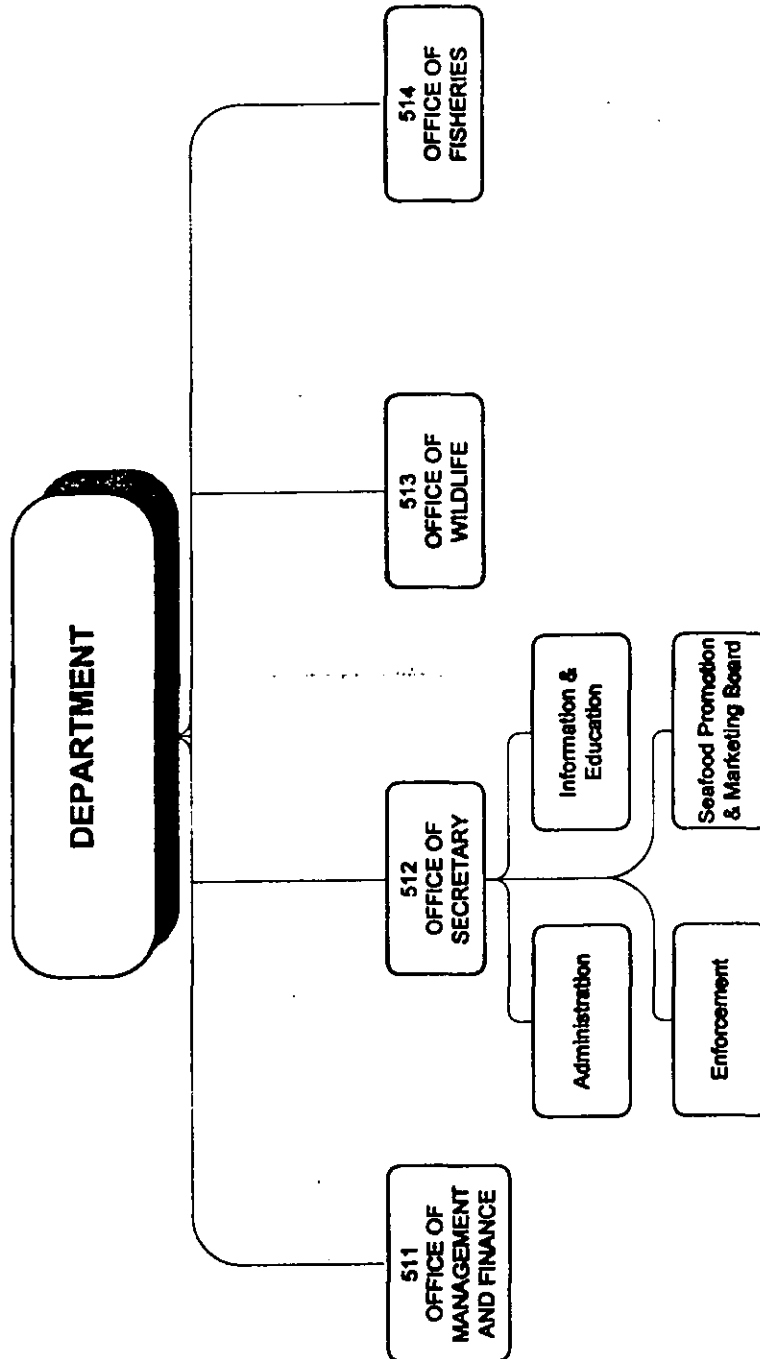
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DEPARTMENT OF WILDLIFE AND FISHERIES

PROGRAM ORGANIZATION CHART



INTERNAL FACTORS

(ELEMENTS OF THE ORGANIZATION'S POSITION, PERFORMANCE, PROBLEMS, AND POTENTIAL WHICH CONTRIBUTE TO ITS STRENGTHS AND WEAKNESSES)

1. Employees

- Tenure, education, training, and experience of managers
- Attitude, morale
- Promotional opportunities
- Methods for rewards/discipline
- Length of service of top administrators
- Continuing education/training
- Responsiveness to change
- Trust in planning process
- Involvement in decision-making processes
- Parity in pay with other agencies

2. Management

- Continuity of direction
- Skills of supervisors and managers
- Support for planning process
- Turnover every 4 years
- Ability to inspire loyalty and trust

3. Organization/Other

- Continuity of core programs
- Continuity of direction
- Intra departmental cooperation, communication
- Enabling legislation and subsequent legislative mandates
- Administrative paperwork and processes
- Condition of capital assets/physical plant
- Functional and organizational structure

EXTERNAL FACTORS

(ELEMENTS, OR FORCES WHICH INFLUENCE THE ORGANIZATION'S ENVIRONMENT THROUGH OPPORTUNITIES AND THREATS)

1. Finances

Financial status of state government
Economy of state

2. Constituents

Level of knowledge
Trust, support
Demographics
Attitude
Compatibility (conflicting wants/needs)
Special interest groups
Number of persons/groups impacted

3. Administration

DOA policies/requirements/budget process (rule/govern by "exception")

4. Other

Weather conditions
Technology
Educated/experienced applicant pool
Balanced, productive ecosystem

5. Politics

Climate
Support
Cooperation among agencies/partnerships
Laws

OTHER CRITICAL ISSUES

1. Need for recodification of statutes relative to
 - a. organization
 - b. clarification of roles of the Commission vs. the Department
 - c. clarification of program responsibilities
2. Public use of Department-owned/managed lands (road maintenance, etc.)
3. Future funding for land acquisition
4. Difficulties in raising license fees
5. Lack of funding for adequate control of aquatic weeds
6. Need to relocate the New Orleans office
7. Inadequate staffing and upkeep of Wildlife Management Areas and Refuges
8. Deteriorating condition of physical facilities
9. Absence of accounting for depreciation in state's financial system

GLOSSARY OF TERMS

<i>administration</i>	<i>manage or supervise the execution, use or conduct of</i>
<i>collaboration</i>	<i>work jointly with others; cooperate</i>
<i>conservation</i>	<i>careful preservation and protection</i>
<i>control</i>	<i>exercise restraining or directing influence over; regulate</i>
<i>create</i>	<i>bring into existence; invent; bring about by action or behavior</i>
<i>development</i>	<i>promote the growth of; make available or usable</i>
<i>direction</i>	<i>guidance or supervision; management; authoritative instruction</i>
<i>educate</i>	<i>develop mentally or morally by instruction; provide knowledge and development</i>
<i>enforce</i>	<i>strengthen; gain or effect by force; carry out effectively</i>
<i>enhance</i>	<i>make greater as in value, desirability, or attractiveness</i>
<i>enjoy</i>	<i>take pleasure; have for one's use</i>
<i>enjoyment</i>	<i>possession and use; gives keen satisfaction</i>
<i>fishery</i>	<i>the act, process, occupation, or season of taking fish</i>
<i>maintain</i>	<i>keep in existing state; preserve; defend; sustain; affirm; support</i>
<i>manage</i>	<i>direct with skill; treat with care; alter by manipulation</i>
<i>operate</i>	<i>run or control the functioning of; conduct the affairs of; manage</i>
<i>opportunity</i>	<i>favorable juncture of circumstances; change for progress or advancement</i>
<i>optimize</i>	<i>make as perfect, effective, or functional as possible</i>
<i>premier</i>	<i>number one</i>
<i>preserve</i>	<i>to keep safe from harm, injury or destruction; protect; maintain</i>
<i>promote</i>	<i>contribute to the growth or prosperity of; help bring into being</i>
<i>protect</i>	<i>shield from injury or destruction; guard; defend; save from loss</i>
<i>regulate</i>	<i>govern or direct according to rule; bring order, method or uniformity to</i>
<i>renewable</i>	<i>capable of being replace by natural ecological cycles or sound mgmt practices</i>
<i>replenish</i>	<i>stock; nourish; build up again; replace</i>
<i>research</i>	<i>careful or diligent search; studious inquiry or examination</i>
<i>stewardship</i>	<i>responsibility for management with regard for the rights of others</i>
<i>supervision</i>	<i>critical watching and directing; oversight</i>
<i>sustain</i>	<i>support, nourish, prolong</i>
<i>utilization</i>	<i>practical use or account</i>

KEY CONTACT PERSONS

EXECUTIVE STAFF

James H. Jenkins, Jr., Secretary	765-2623
Clyde Kimball, Deputy Secretary	765-2857
Phil Bowman, Assistant Secretary	765-2806
John Roussel, Assistant Secretary	765-2801
James L. Patton, Undersecretary	765-2860

OFFICE OF MANAGEMENT AND FINANCE

Wynnette Kees, Accountant Administrator/Facilitator	765-2862
David Lavergne, Economist/Assistant Facilitator	765-2864

ENFORCEMENT

Winton Vidrine, Colonel	765-2989
Charles R. Clark, Lieutenant Colonel	765-2983
Brian Spillman, Major	765-2981
Monique Appeaning, Secretary	765-2469

INFORMATION AND EDUCATION

Dr. Lyle M. Soniat, Director	765-2916
Wayne Huston, Acting Assistant Director	765-2933
Marianne Marsh, Communications Director	765-2496

SEAFOOD PROMOTION AND MARKETING BOARD

Chris Hebert, Assistant Director	504-568-5693
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WILDLIFE

Hugh Bateman, Administrator, Wildlife Division	765-2347
Tommy Prickett, Assistant Administrator, Wildlife Division	765-2349
Brandt Savoie, Administrator, Fur/Refuge Division	765-2812
Dave Arnoldi, Assistant Administrator, Fur/Refuge Division	765-2814

FUR AND ALLIGATOR ADVISORY COUNCIL

Darrell Dupont, Chairman	318-775-5928
Greg Linscombe, Program Manager (DWF staff representative)	318-372-0032

FISHERIES

Karen Foote, Administrator, Marine Fish Division	765-2384
Claude Boudreaux, Assistant Administrator, Marine Fish Division	765-2935
Bennie Fontentot, Administrator, Inland Fish Division	765-2330
Don Lee, Assistant Administrator, Inland Fish Division	765-2331

LA WILDLIFE AND FISHERIES COMMISSION MEMBERS

(November, 1998)

THOMAS M. GATTLE, CHAIRMAN

DANIEL J. BABIN, VICE-CHAIRMAN

BILL A. BUSBICE, JR.

JERALD HANCHEY

GLYNN CARVER

NORMAN MCCALL

THOMAS E. KELLY

THE DEPARTMENT

The **mission** of the Department of Wildlife and Fisheries and the Wildlife and Fisheries Commission is to manage, conserve, and promote wise utilization of Louisiana's renewable fish and wildlife resources and their supporting habitats through replenishment, protection, enhancement, research, development, and education.

It is our **vision** that Louisiana will be the premier state for wildlife and fisheries resource management by providing maximum and sustainable opportunities for all users of the resources, and that there will be recognition of and confidence in the management abilities of the Department and the Commission.

The **philosophy** of the Department and the Commission is that our mission will be accomplished in a fair and equitable fashion using science-based information, open communication, and collaboration. The policies and actions of the Department and the Commission shall be developed and implemented so as to encourage teamwork among their employees and so as to promote the trust and respect of the public.

The **goals** of the Department and the Commission are:

- * To provide our stakeholders with opportunities for knowledge, use, and enjoyment of the resources;
- * To provide a safe environment for the users of the resources;
- * To improve stakeholder satisfaction by addressing the growing and varied threats to sustainable fish and wildlife populations and to recreational and commercial user opportunities.

THE OFFICE OF MANAGEMENT AND FINANCE

The Office of Management and Finance performs the fiscal and administrative functions for the Department of Wildlife and Fisheries. The **mission** is to provide leadership, support, and information while meeting the operational, functional, and administrative needs of the Department. Regulatory and support services are provided in the areas of: finance, budget, planning, contract management, information systems, human resources, property and fleet management, socioeconomics, and procurement. This unit also includes the recreational and commercial license and motorboat registration sections.

The **vision** of the Office of Management and Finance is that all services and support will be provided timely and accurately, and that the Department will be in full compliance with all applicable regulations and laws governing its operations.

It is the **philosophy** of this organization that customer satisfaction be the main focus and that regulatory and financial services be provided in a professional manner.

The **goals** of the Office of Management and Finance are:

- * to improve internal controls and compliance with all legal, financial, and operational requirements,
- * to employ the most sound management, financial, and human resource practices,
- * to maximize employee productivity department-wide and assure a quality workforce,
- * to satisfy the socioeconomic research needs of program staff, and
- * to ensure availability of legally required licenses to the public;

all this for the benefit of the citizens of the state.

511 - OFFICE OF MANAGEMENT AND FINANCE PROGRAM A - MANAGEMENT AND FINANCE

MISSION: The mission is to provide leadership, support, and information while meeting the operational, functional, and administrative needs of the Department. Regulatory and support services are provided in the areas of: finance, budget, planning, contract management, information systems, human resources, property and fleet management, socioeconomics, and procurement. This unit also includes the recreational and commercial license and motorboat registration sections.

GOALS:

- I. To improve internal controls and compliance with all legal, financial, and operational requirements,
- II. To employ the most sound management, financial, and human resource practices,
- III. To maximize employee productivity department-wide and assure a quality workforce,
- IV. To satisfy the socioeconomic research needs of program staff, and
- V. To ensure availability of legally required licenses to the public.

OBJECTIVE I.1.

To perform the defined management and financial functions so as to minimize repeat audit findings by the Legislative Auditor and promptly resolve all findings.

STRATEGIES:

Establish an internal audit function and obtain necessary head count
Develop system to track progress on resolution of all findings

OBJECTIVE II.1. AND III.1.

To provide support services to Department programs which enable them to meet their objectives.

STRATEGIES:

Employ skilled, trained employees
Identify "best practices" and implement in this Department
Utilize Performance Planning and Rating Program

**511 - OFFICE OF MANAGEMENT AND FINANCE
PROGRAM A - MANAGEMENT AND FINANCE**

OBJECTIVE IV.1.

Provide socioeconomic assistance to Department programs which will enable them to meet their objectives

STRATEGIES:

Assist with development and conduct of customer surveys
Assist with development and implementation of Customer Service Plan
Conduct economic analyses as requested

OBJECTIVE V.1.

To ensure non-public issuing agents have adequate and timely supply of licenses.

STRATEGIES:

Maintain appropriate sales records
Order and distribute timely

OBJECTIVE V.2.

To ensure timely processing of those licenses and registrations issued by the Department.

STRATEGIES:

Employ sufficient and trained staff
Monitor output of employees

THE OFFICE OF SECRETARY

The Office of Secretary is comprised of the functions of administration, law enforcement, information and education, and the Seafood Promotion and Marketing Board. The Secretary is the organizational head of this unit which serves to support and promote resource management and to execute the laws related to the Department's programs. The mission of the Office of Secretary is to provide support, direction, enforcement, and education toward the conservation of the state's renewable natural resources for the benefit of the citizens of the state and for the preservation of a healthy ecosystem.

It is our vision that the citizens of Louisiana will maintain voluntary compliance with wildlife laws, that they will be knowledgeable about resource management, and that they will enjoy a safe environment in which to participate in the outdoor activities managed by the Department.

The philosophy of the Office of Secretary is that we will be accountable for our programs and actions, and we will earn the esteem of the state's citizens by providing excellent customer service.

The goal is to continually improve efforts in enforcement and education by ensuring adequate financial resources and by identifying and meeting the expectations of our customers.

**512 - OFFICE OF SECRETARY
PROGRAM A - ADMINISTRATION**

MISSION: The Administration Program is composed of the offices of the Secretary, Deputy Secretary, Legal, and Investigators. The mission of the Administration Program is provide executive leadership and legal services to all other programs and organizations within the Department of Wildlife and Fisheries so that each has the resources necessary to accomplish their goals and objectives.

GOALS:

- I. To ensure that the missions, goals, and objectives of the programs within the Department are consistent with legislative intent and legal authority
- II. To provide policy-making and decision-making functions which enable programs to accomplish the Department's mission of conservation
- III. To provide executive direction for the Enforcement and Information and Education Programs
- IV. To provide advice, counsel, and legal opinion to the Commission, the Secretary and his assistants, and to other units of the Department
- V. Ensure improved stakeholder satisfaction with the services provided by the Department
- VI. Ensure efficient and effective use of assets and resources by the programs within the Department

512 – OFFICE OF SECRETARY PROGRAM B -ENFORCEMENT

MISSION:

The mission of the Enforcement Program is to protect Louisiana's fish and wildlife resources and their habitats by enforcing related laws and regulations and to create a secure environment for the maximum enjoyment of hunting, fishing, recreational boating and affiliated outdoor activities. The clients served by this program are the citizens of the state.

The program works to promote voluntary compliance and ethical participation in these activities through education, and through firm, fair, and impartial law enforcement.

GOALS:

- I. Ensure that fish and wildlife populations will be sustainable in the present and future
- II. Promote a safer boating, fishing and hunting environment for maximum conservation and enjoyment of the state's waterways, fish and wildlife.
- III. Measure stakeholder satisfaction and make improvements

OBJECTIVE I.1:

In order to ensure species sustainability, the Enforcement Program will provide protection to the extent that no fish or wildlife species become threatened or extinct due to insufficient law enforcement by June 30, 2003.

STRATEGY I.1.1 Provide visible law enforcement presence on waterways, hunting and fishing localities

STRATEGY I.1.2 Provide concentrated enforcement efforts in areas where increased illegal activity occur and areas with high use

STRATEGY I.1.3 Obtain funding to provide overtime hours for peak times and seasons

PERFORMANCE INDICATORS:

Input: Baseline resource allocation for program

Output: Number of field patrol hours
Number of public contacts

Outcome: No change in fish or wildlife population status due to lack of enforcement
Efficiency: No change in fish or wildlife population status due to lack of enforcement

OBJECTIVE I.2: In order to increase the compliance to the state's statutes and regulations relative to wildlife and fisheries, the Enforcement Program will measure the compliance of hunters and fisher-persons checked and increase patrol in the high non-compliant areas by 10% by June 30, 2003. (FY99 will be the baseline year to determine the percentage of compliance among hunters and fisher-persons checked. This will be determined by October 1999.)

STRATEGY I.2.1 Provide concentrated enforcement efforts in areas where increased illegal activity occur and areas with high use

STRATEGY I.2.2 Establish the necessary manpower and equipment in high use areas

STRATEGY I.2.3 Provide visible law enforcement presence on waterways, hunting and fishing localities

PERFORMANCE INDICATORS:

Input: Baseline resource allocation for program
Number of licensed hunters
Number of licensed recreational fisher-persons
Number of licensed commercial fisher-persons
Output: Number of field patrol hours
Number of checked hunters
Number of checked fisher-persons
Number of non-compliant hunters
Number of non-compliant fisher-persons
Number of public contacts
Outcome: Percentage change in non-compliance
Efficiency: Percentage change in non-compliance per number of licensed hunters
Percentage change in non-compliance per number of licensed recreational fisher-persons
Percentage change in non-compliance per number of licensed commercial fisher-persons
Percentage change in non-compliance per number of hunters checked
Percentage change in non-compliance per number of fisher-persons checked

OBJECTIVE II.1.

In order to reduce the number of boating accidents and promote a safer boating environment, the Enforcement Program will measure the compliance of recreational boaters and increase patrol in the high non-compliant areas by 10% by June 30, 2003. (FY99 will be the baseline year to determine the percentage of compliance among boaters. This will be determined by October 1999.)

STRATEGY II.1.1 Provide visible law enforcement presence on waterways

STRATEGY II.1.2 Identify the geographic locations with high use for boating activity

STRATEGY II.1.3 Meet with stakeholders to determine ways to promote safer boating

STRATEGY II.1.4 Distribute adequate manpower and equipment resources to provide effective enforcement in these areas

STRATEGY II.1.5 Develop a statewide public boating safety educational program that offers a minimum of one class monthly in each of the nine regions

STRATEGY III.1.6 Develop legislation for mandatory boating education for all registered water-craft owners and operators

PERFORMANCE INDICATORS:

Input: Baseline resource allocation for program

Number of Registered Boats

Number of Boating Safety Education Courses

Number of Boating Safety Enforcement Patrol Hours

Output: Number of students completing the boating education course

Number of Boating Accidents

Outcome: Percentage change in Boating Accidents

Efficiency: Percentage change in Boating Accidents per Number of Boating Safety Enforcement Patrol Hours

Percentage change in Boating Accidents per Number of Registered Boats

OBJECTIVE III.1.1 In order to determine the level of stakeholder satisfaction, the Enforcement Program will survey stakeholders and measure the level of satisfaction. Once the level of stakeholder satisfaction has been determined the Enforcement Program will increase the level of satisfaction by 10% by June 30, 2003. (FY99 will be the baseline year to determine the current level of stakeholder satisfaction. This will be determined by October 1999.)

STRATEGY III.1.1 Develop a survey to measure the level of stakeholder satisfaction

STRATEGY III.1.2 Conduct meetings with fisheries and wildlife stakeholders to draft potential legislation to simplify regulations

STRATEGY III.1.3 Develop a web-site to make available information involving the Enforcement Program and Operation Game Thief

STRATEGY III.1.4 Develop and implement a warning citation system to educate stakeholders on certain minor violations as opposed to levying fines

STRATEGY III.1.5 Meet quarterly with Operation Game Thief (OGT)

STRATEGY III.1.6 Distribute Operation Game Thief No Poaching Signs

STRATEGY III.1.7 Provide and maintain support of technological advancements to increase efficiency and effectiveness of law enforcement operations

STRATEGY III.1.8 Provide a reporting system to track all of Communication section's public contact

STRATEGY III.1.9 Continue collaborative efforts with other agencies and department personnel to promote safety increase health related oyster inspections

PERFORMANCE INDICATORS

Input: Baseline resource allocation for program
Number of Surveys Distributed

Output: Number of Students Completing the Boating Education Course
Number of New Releases
Number of Public Contacts
Number of Survey Responses Received

Outcome: Percentage change in Stakeholder Satisfaction

Efficiency: Percentage change of Stakeholder Satisfaction

**512 - OFFICE OF SECRETARY
PROGRAM C - INFORMATION AND EDUCATION**

MISSION: The mission of the Information and Education Division is to inform and educate the public about our wildlife resources and their habitats in order that they become more knowledgeable, more responsible stewards and better able to enjoy the benefits of the resource, and to promote sustainable resource populations for the present and future.

GOALS:

- I. Through the efforts of the Information and Education staff, there will be increased public awareness, participation and appreciation regarding wildlife and aquatic resources and regarding the function of this department in the management of those resources.
- II. To promote a safer hunting environment.

OBJECTIVE I.1.

To increase adult-and-youth public participation in educational programs and activities by 1 % within 5 years.

STRATEGIES:

- I.1.1. Increase participation in camps and workshops.
- I.1.2. Conduct tours and educational presentations to youth and adult groups at Department facilities.
- I.1.3. Link our programs to the Education Department Science curriculum standards.
- I.1.4. Increase funding in order to meet program demand.
- I.1.5. Provide information to the public via LDWF Internet web site.

PERFORMANCE INDICATORS:

- | | |
|-------------|--|
| Input: | Number of hours of instructional time. |
| Output: | Number of participants by type of event. |
| Outcome: | Percentage increase of participation over previous year. |
| Efficiency: | Ratio of instruction hours to participants. |

OBJECTIVE I.2.

To increase the level of knowledge by the general public by 1 % within 5 years .

**512 - OFFICE OF SECRETARY
PROGRAM C - INFORMATION AND EDUCATION**

STRATEGIES:

- I.2.1. Increase magazine circulation.
- I.2.2. Promote more use of audio-visual library products and services.
- I.2.3. Distribute news package more often than weekly.
- I.2.4. Utilize department staff in topic development.
- I.2.5. Link the DWF homepage to Internet sites.
- I.2.6. Conduct surveys.
- I.2.7. Increase funding in order to increase instructional demand.

PERFORMANCE INDICATORS:

- Input: Population of LA
 Budget
- Output: Magazine distributed
 Visitors/users of library
 Number news units*
 Number of hits to web page
- Outcome: Percent increase in knowledge (results of survey)
- Efficiency: Total number of outputs in relation to budget

*(News Units are defined as an individual news or informational topic distributed to the public or media.)

OBJECTIVE II.1.

To keep the hunter accident ratio(HAR)* below the level** before mandatory hunter education.

STRATEGIES:

- II.1.1. Increase number of volunteer instructors
- II.1.2. Provide advanced, in-service training for all instructors
- II.1.3. Link instructional programs to address causes of hunting accidents.

*HAR: Number of hunting accidents/100,000 licenses sold.

**Level: 5 year average

PERFORMANCE INDICATORS:

- Inputs: Number of volunteer instructors active
 Number of licensed hunters in LA
 Budget

**512 - OFFICE OF SECRETARY
PROGRAM C - INFORMATION AND EDUCATION**

Outputs: Number participants
 Number of courses

Outcome: HAR*

Efficiency: Cost per participant
 Participants per instructor

**512 - OFFICE OF SECRETARY
PROGRAM D - SEAFOOD PROMOTION AND MARKETING BOARD**

MISSION: The Seafood Promotion and Marketing Board was created under authority of R.S. 56:578 et seq to address concerns about the declining economic environment of the commercial fishing industry in Louisiana. The Board's mission is to aid the commercial fishing industry through product promotion and marketing development. It serves commercial fishermen and wholesale and retail dealers by providing a coordinated marketing function and by conducting activities with the purposes of enhancing the public image of commercial fishery products, promoting consumption of these products, and assisting the seafood industry in market development.

GOAL:

- I. Commercial fishermen will realize higher dockside values for seafood products thus contributing to the economic health of the state and the industry.

OBJECTIVE I.1.

Increase the demand for Louisiana seafood products to result in higher dockside prices.

STRATEGIES:

- I.1.1. Educate consumers about economic and health benefits, and about contamination threats
- I.1.2. Educate industry participants about product liability issues, labor relations, processing methods, financing, marketing, and regulations
- I.1.3. Assist with the development of new markets
- I.1.4. Promote the superior quality of LA products
- I.1.5. Distribute promotional materials
- I.1.6. Conduct retail promotional events

PERFORMANCE INDICATORS

Inputs	Number consumers
	Dollars spent on these activities
	Number man hours spent on these activities
Outputs	Number trade shows attended
	Number retail promotions conducted
	Number advertisements published
	Number news releases distributed

**512 - OFFICE OF SECRETARY
PROGRAM D - SEAFOOD PROMOTION AND MARKETING BOARD**

Outcome	Percent increase in dockside value
Efficiency	Ratio of man hours and dollars to percent increase

OBJECTIVE I.2.

Within five years, restore consumer confidence in and stabilize the consumption of oysters.

STRATEGIES:

- I.2.1. Develop new export markets
- I.2.2. Provide consumers with different methods of preparing cooked oysters
- I.2.3. Research processing alternatives

PERFORMANCE INDICATORS

Inputs	Historic and current consumption
Outputs	Number marketing efforts
Outcome	Percent change in consumption Consumer surveys
Efficiency	Cost to effect change

THE OFFICE OF WILDLIFE

The functions of the Office of Wildlife include development of public lands for wildlife activities and conservation of wildlife species. It is the **mission** of the Office of Wildlife: to operate the 49 management areas and refuges so as to optimize public opportunities for wildlife recreation, to promote biological diversity, and to ensure a sustained population of resources for future generations.

It is the **vision** of this organization that land and resource management techniques will be successful resulting in satisfactory hunter effort and that populations will be adequate and sustained for the future.

The **philosophy** of the Office of Wildlife is that it's actions and programs will be guided by scientific basis and that the needs of all resource "users" shall be considered in management decisions.

The **goals** of the Office of Wildlife are:

- * to improve efforts in technical assistance,
- * to perform adequate land and facility maintenance and upkeep, and
- * to employ successful species management techniques;

all of these for the benefit of and enjoyment by the citizens of the state.

513 - OFFICE OF WILDLIFE PROGRAM A - WILDLIFE

MISSION: The Wildlife Program is composed of professional biologists, technicians and support personnel which staff the land-stewardship organizational units whose mission is to develop, maintain, enhance, manage, and promote wildlife resources, their habitats, and biological diversity while providing conservation-based recreational and commercial opportunities for the public.

GOALS:

- I. Ensure that wildlife resource stakeholders experience greater satisfaction in their activities through improved efforts in technical assistance programs and with greater accessibility, opportunities and experiences in utilizing the wildlife resources of the state.
- II. Ensure that all species of wildlife, including flora of special concern, sustain their populations through management efforts directed towards quality, quantity and diversity of habitat in order to counter threats of adverse alteration or loss of wildlife habitat in Louisiana.

OBJECTIVE I.1.

Provide 8.1 million user-days of wildlife oriented activities for Louisiana wildlife resource stakeholders utilizing public and private lands, including 1.2 million user-days on the public WMA and Refuge systems annually by the year 2003.

STRATEGIES:

- I.1.1. Develop and recommend hunting seasons, bag limits, and regulations annually that permit sustainable wildlife populations.
- I.1.2. Provide technical assistance to Louisiana residents annually to foster better stewardship of private properties for wildlife.
- I.1.3. Enhance wildlife habitat through development and implementation of partnerships to improve habitat on private lands.
- I.1.4. Conduct research on wildlife ecology, habitat management techniques and survey targeted wildlife species.
- I.1.5. Provide wildlife resource expertise in urban settings.
- I.1.6. Increase the acreage in the WMA and Refuge system by 50,000 acres by 2003 through the securing of authorization and funding for purchase of desirable tracts.
- I.1.7. Request approval of \$200 thousand of funding per new and expanded budget request to survey stakeholders.

**513 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE**

- expanded
- I.1.8. Develop WMA's and refuges to their fullest potential through an increase in personnel, acquisitions and major repairs by \$15.5 million per new and budget request.
 - I.1.9. Conduct managed hunts/trapping on WMA's and Refuges
 - I.1.10. Provide infrastructure for public access on WMA's and Refuges.
 - I.1.11. Provide public use facilities on WMA's and Refuges.
 - I.1.12. Provide multi-use resource opportunities on WMA's and Refuges.

PERFORMANCE INDICATORS:

formulate WMA's	Inputs	<ul style="list-style-type: none"> Number of habitat evaluations conducted statewide Number of man-days to conduct biological investigations, recommendations and conduct managed hunts on and Refuges Number of man-days and funds used to maintain roads and campgrounds on WMA's and Refuges Number of wildlife surveys (including urban) conducted Number of technical assistance requests received Number of species for which population indices warrant the establishment of hunting or trapping seasons Cost of land and overhead
	Outputs	<ul style="list-style-type: none"> Number of species for which hunting and trapping regulations are promulgated Number of man hours expended to develop and recommend wildlife standards and new practices Number of persons receiving verbal , written, or on site technical assistance, including those in urban settings Number of wildlife species with developed indices of population size Number of recommendations developed for new or existing wildlife standards or practices Number of acres of wildlife habitat improved Number of new standards and practices incorporated into Department and public wildlife management programs Total harvest of major wildlife species Number of acres of wildlife habitat improved and the number of technical assistance calls responded to Number of landowner contacts, tract evaluations, appraisals and negotiations to acquire land Total number of days of public hunting and trapping permitted on

**513 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE**

	WMA's and Refuges
	Number of miles of roads and trails maintained on WMA's and Refuges
	Number of public use facilities such as boat ramps, shooting ranges, water control and recreational access structures, campgrounds, nature trails, comfort stations built or maintained on WMA's and Refuges
Outcomes	Number of user days of outdoor recreation provided to the public
	Harvest per unit of effort for game and commercial wildlife species
	Number of technical assistance responses per technical staff member
	Number of tracts acquired through purchase, lease or donation
	Number of user days for hunting and trapping on WMA's and Refuges
	Total number of miles of roads and trails on WMA's and Refuges maintained
	Total number of all user days on WMA's and Refuges
	Harvest of major species on WMA's and Refuges
Efficiency	Stakeholder satisfaction in management programs
	Stakeholder satisfaction in use of WMA's and Refuges
	Percent of roads, trails and public use facilities in usable condition on WMA's and Refuges

OBJECTIVE II.1.

Acknowledging the threats of numerous human-induced activities, assure no net loss of the functions and values of federally regulated wetlands, and other non-federally regulated wildlife habitat through the year 2003 by requiring at least 1:1 habitat unit replacement, establishment of Scenic Rivers servitudes, nutria control and utilization, habitat improvement on WMA's and Refuges, and providing technical assistance to landowners for voluntary enhancement, creation or restoration of non-regulated wildlife habitat.

STRATEGIES:

- II.1.1. Mitigate habitat losses and protection of wildlife populations through exercise of our statutory authority under Federal and State environmental regulatory programs
- II.1.2. Enroll habitat in the Natural Areas Registry

**513 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE**

- II.1.3. Establish Scenic River Servitudes in compliance with statutory mandates, and provide for optimal aesthetic and recreational usage.
- II.1.4. Provide technical assistance to governmental agencies, industry and private individuals aimed at wildlife habitat improvement and creation.
- II.1.5. Manage water within impoundment systems on WMA's and Refuges to provide quality wetland habitat
- II.1.6. Annually conduct timber inventories and harvests to improve wildlife habitat on Department-owned lands
- II.1.7. Annually conduct prescribed burning to improve wildlife habitat on Department-owned pineland, marshland, and old field habitat
- II.1.8. Conduct habitat management and wildlife ecology studies to assess potential impacts of various management techniques on WMA's and Refuges
- II.1.9. Develop and maintain early successional habitat and forest openings on Department-owned lands
- II.1.10. Insure that mineral development is completed with minimal adverse environmental impact to Department-owned lands
- II.1.11. Develop habitat improvements on 100,000 acres on WMA's and Refuges by 2003.

PERFORMANCE INDICATORS:

the	Inputs	Number of man hours and costs spent on Mitigation of wetland loss
		Number of man hours and costs of enrolling landowners in the Natural Area Registry program
		Number of man hours and costs of coordinating the Scenic Streams program
		Number of man hours and costs of providing habitat related advice
		Acres affected by 404 permit requests
		Man days of staff time and costs of managing impoundments on WMA and Refuge system
		Staffing and money used to manage and establish forest lands on Department-owned lands
		Man days utilized to prescribe burn forest, marsh and old field habitat on WMA's and Refuges
		Man days directed toward research and survey on WMA's and Refuges
	Outputs	Number of permit applications commented on
		Number of landowners contacted to enroll in the Natural Area Registry

**513 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE**

	Number of Scenic River contacts made and tracts evaluated
	Number of non-regulated habitat contacts made and tracts evaluated
	Number of water control structures installed, repaired, and operated annually and the acres receiving habitat manipulation annually on WMA's and Refuges
	Number of timber inventories completed, prescriptions developed, stands marked for harvest, and bids solicited on Department owned lands
	Number of acres prescribe burned on WMA's and Refuges
	Number of studies completed or populations surveyed on WMA's and Refuges
Outcomes	Number of habitat units protected (mitigated)
	Number of landowners enrolled in the Natural Area Registry
	Number of miles of Scenic River frontage protected
	Number of acres of wildlife habitat improved
	Number of acres of shallow water habitat provided annually on WMA's and Refuges
	Acres of timber harvested or reforested annually on Department owned lands
	Number of acres improved for wildlife by maintaining early successional habitat on WMA's and Refuges
	Acres of wetlands mitigated / acres damaged
	Number of Scenic River contacts / servitude established
	Number of habitat improvement contacts / acres improved
	Number of wetland dependant birds using the impoundments at WMA's and Refuges
	Number of habitat improvement contacts / acres improved
	Number of wetland dependant birds using the impoundments at WMA's and Refuges
Efficiency	Percent of suitable tracts enrolled in Natural Area Registry
	Percent of forestry prescriptions completed on Department owned lands
	Percent of acres prescribed for burning on Department owned lands
	Percent of studies and surveys completed on WMA's and Refuges

OBJECTIVE IL2.

**513 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE**

Develop plans by 2003 for identifying, managing and recovery of five rare, threatened, or endangered species (RTE), and for managing other non-game and nuisance species.

STRATEGIES:

- II.2.1. Continue to receive funding through Section 6 of the Endangered Species Act
- II.2.2. Contract with qualified individuals and organizations for biological surveys concentrating on populations and ranges of RTEs and native plants
- II.2.3. Conduct additional surveys identical to contracted surveys
- II.2.4. Determine management options for identified species
- II.2.5. Complete on-line nuisance animal control permitting system, and train and license Nuisance Animal Control Operators
- II.2.6. Certify and permit wildlife rehabilitators

PERFORMANCE INDICATORS:

Inputs	Man days spent on rare, threatened, and endangered species biological investigations Man days preparing recovery plans for rare, threatened, and endangered species Man days of planning and regulating Nuisance Animal Control and wildlife rehabilitator
Outputs	Number of rare, threatened, and endangered species surveys completed Number of RTE recovery plans completed Develop a new training and licensing program for nuisance animal control operators and the number of wildlife rehabilitator contacts made
Outcomes	Number of RTE species for which range is identified Number of RTE recovery plans implemented Number of nuisance animal control operators trained and licensed Number of wildlife rehabilitators under permit
Efficiency	Percent of RTE surveys completed on time Percent of recovery plans implemented Percent of parishes with licensed nuisance animal control operators and

**513 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE**

wildlife rehabilitators

**512 - OFFICE OF WILDLIFE
PROGRAM A - WILDLIFE (LOUISIANA FUR AND ALLIGATOR ADVISORY
COUNCIL)**

MISSION: The Louisiana Fur and Alligator Advisory Council was created under authority of R.S. 56:266.C. to be responsible for reviewing and approving recommended procedures and programs to be funded from the Louisiana Fur and Alligator Public Education and Marketing Fund and the Louisiana Alligator Resource Fund. The Council's mission is to aid the fur and alligator industries through education, product promotion, and marketing development. It's clients include trappers, coastal land owners, fur buyers and dealers, hunters, and all participants in the industries. The Council provides a cohesive, coordinated and comprehensive effort towards marketing and conducts activities with the purposes of: educating the public regarding renewable resource management, promotion of raw and finished products, and making management recommendations.

GOALS:

- I. Through the efforts of the Fur and Alligator Advisory Council, economic impact of the fur and alligator industries on the state will be enhanced (made greater in value and attractiveness).
- II. Through the efforts of the Fur and Alligator Advisory Council, fur and alligator industry participants and the general public will become more knowledgeable about these resources, their value to the state, and the goal of sustainable use.

OBJECTIVE I.1.

To increase the harvest of La. furbearers by 5% each year through promotional activities resulting in improved sales of fur products.

STRATEGIES:

- I.1.1. Maintain existing markets through exposure of products at major fur fairs
- I.1.2. Maintain existing markets and develop new markets through advertisements.
- I.1.3. Develop new markets in Eastern Europe and mainland China through seminars

PERFORMANCE INDICATORS:

Input	Number of La. pelts harvested
	Number pelts shipped into different countries
	Dollars expended on this objective
	Number of man hours spent on activities

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Outputs	Number promotional events attended Number of contacts Number of seminars Number of participants
Outcome	Percent increase in pelts harvested
Efficiency	Ratio of dollars spent and man hours to increase in harvest

OBJECTIVE I.2.

To increase the market demand (value, price, and volume) for raw and finished alligator products by 2% each year.

STRATEGIES

- I.2.1. Maintain existing markets by exposure at major leather fairs.
- I.2.2. Maintain existing markets and develop new markets using Point of sale booklets, newsletters, and annual reports.

PERFORMANCE INDICATORS

Input	Number of manufacturers in U.S. using alligator Number of retailers in U.S. using alligator Dollars spent on this objective Number of man hours spent on this objective
Output	Number of promotional events Number of contacts
Outcome	Percent increase in sales of finish leather in U.S. Percent increase in sales of products in U.S. Total sale of alligator skins
Efficiency	Ratio of dollars spent and man hours to increase in sales of skins and products in the U.S.

THE OFFICE OF FISHERIES

The **mission** of this organizational unit is to conserve and protect Louisiana's renewable aquatic resources for present and future generations; this is done by controlling harvest and by replenishing and enhancing fishery stocks and habitats.

The **vision** of the Office of Fisheries is that populations will be sustainable and sufficient and that stakeholders will be knowledgeable about and active in resource management.

The **philosophy** is that this unit's actions and programs will be guided by scientific basis and that the needs of all resource "users" shall be considered in management decisions.

The **goals** of the Office of Fisheries are:

- * to maintain a healthy fishery, and
- * to ensure stakeholder satisfaction;

for the benefit of and enjoyment by the citizens of the state.

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PROGRAM A - FISHERIES

MISSION: It is the mission of the Office of Fisheries to conserve and protect Louisiana's renewable aquatic resources for present and future generations of Louisiana citizens by controlling harvest and by replenishing and enhancing stocks and habitat.

GOALS:

- I. Maintain Louisiana's premier status as a national leader both in commercial fisheries production and in quality recreational fishing opportunities, by ensuring that aquatic resource populations will be sustainable in the present and future.
- II. Ensure that customers are satisfied with the health of Louisiana's living aquatic resources, and their opportunities to use, enjoy and profit from these resources.

OBJECTIVE I.1.

Maintain and enhance the health of the major marine resources, and reduce any uncertainty regarding that health.

STRATEGIES:

- I.1.1: Enhance the collection of fishery independent information on each species harvested and their associated environments.
- I.1.2: Enhance the collection of fishery dependent information from the harvesters of the resource.
- I.1.3: Prepare stock assessments for the major marine species.
- I.1.4: Prepare and update management plans for the major marine species.
- I.1.5: Develop a management plan for species of special concern, including threatened and endangered species of fish in Louisiana.
- I.1.6: Administer a system of oyster leasing and management of public reefs designed for the ordered, rational exploitation of the oyster resource.
- I.1.7: Protect and maintain fish habitat.
- I.1.8: Monitor and regulate seismographic operations in order to protect and conserve the wildlife of the state of Louisiana including all aquatic life.
- I.1.9: Prepare recommendations to the Wildlife and Fisheries Commission and the Louisiana Legislature for actions required to both rationally exploit and sustain stocks under state jurisdiction.
- I.1.10: Promulgate Louisiana Wildlife and Fisheries Commissions rules and regulations,

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as provided for in statutory law, for the management of the marine fisheries resources.

I.1.11: Coordinate management of interjurisdictional fisheries with the other Gulf states and Federal government.

PERFORMANCE INDICATORS:

Inputs	Number of fishery-independent biological samples taken
	Number of fishery-dependent interviews/samples taken
	Number of fish aged
	Number of fisheries profiles updated
	Number of management plans written/updated
	Number of constant recorders taking hydrological data
	Number of cubic yards of material planted to produce seed oysters
	Number of major fish/shellfish kills
	Number of ongoing seismic projects
	Number of spill incidents with potential to affect trust resources
	Number of requests to create artificial reefs
	Number of person-days spent attending meetings to coordinate coastal fish habitat issues
Outputs	Number of edited, verified records added to the Unified Fisheries Database
	Number of fishery management recommendations made
	Number of constant recorder-days of scientific data collected
	Number of barrels of seed oysters available on the public grounds
	Number of sacks of 3"+ oysters available on the public grounds
	Number of investigations of fish/shellfish kills
	Number of seismic project-day inspections
	Number of spill notifications evaluated
	Number of Natural Resource Damage Assessments completed
Outcomes	Number of permits evaluated to create artificial reefs
	Number of presentations given on coastal fish habitat issues
	Percent of major fish stocks not overfished
	Number of barrels of seed oysters harvested by oyster fishermen from the public grounds
	Number of sacks of 3"+ oysters harvested by oyster fishermen from the public grounds
	Number of spill restoration projects implemented

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	Number of offshore artificial reefs created
	Number of inshore artificial reefs created
	Pounds of menhaden harvested
	Pounds of shrimp harvested
	Pounds of crab harvested
	Pounds of oysters harvested from the public grounds
Efficiency	Percent of possible constant recorder-days of data obtained
	Percent of available seed oysters utilized by oyster lessees
	Percent of available 3"+ oysters utilized by oyster harvesters
	Percent of seismic project-days on which an inspection was made

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OBJECTIVE I.2.

Maintain and enhance the health of the major freshwater fisheries and reduce any uncertainty regarding that health by the year 2003.

STRATEGIES:

- I.2.1: Enhance the collection of fishery independent information from major freshwater lakes.
- I.2.2: Enhance the collection of fishery dependent information on recreational and commercial fishers.
- I.2.3: Develop lake management plans for major freshwater lakes.
- I.2.4: Develop management plans for any aquatic resources which may be of special concern.
- I.2.5: Ensure that aquacultural activities result in no adverse effects upon native fish population in Louisiana.
- I.2.6: Supplement public waters with sport fish and species of concern in support of management plans.
- I.2.7: Coordinate management of interjurisdictional fisheries with the other Gulf states and Federal government.
- I.2.8: Administer statutorily authorized permit programs.

PERFORMANCE INDICATORS

Inputs	Number of water bodies sampled per year with fishery independent sampling
	Number of water bodies sampled per year with fishery dependent sampling (creel)
	Number of major fish kills
	Number of fish requested for stocking in public water bodies
	Number of lakes receiving Florida largemouth bass
	Number of requests to raise/possess fish requiring a permit
	Number of requests for a scientific collection permit
Outputs	Number of lake management plans written or updated
	Number of major fish kills that were investigated
	Number of species profiles written for species of special concern
	Number of fishery management recommendations made
	Number of edited, verified records added to the database

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	Number of fish stocked into public water bodies
	Number of bass checked for genetic identification
	Number of permits processed
Outcomes	Percentage of lakes sampled where fish populations increased or remained stable
	Percentage of fish stocked that were requested
	Percent increase in Florida bass gene in stocked water bodies
	Percentage of requested permits that were processed
Efficiency	The number of lake management plans written per district
	The average number of days it took to process a permit

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OBJECTIVE II.1.

Increase recreational customer satisfaction in quality of fishing experience from 89% to 90% by the year 2003.

STRATEGIES:

- II.1.1: Increase the number of boating access and development projects.
- II.1.2: Supplement public waters with hatchery reared fish in support of management plans.
- II.1.3: Provide technical assistance to the owners of private lakes and ponds.
- II.1.4: Conduct periodic customer satisfaction survey.
- II.1.5: Educate public on the principles of fisheries management through a coordinated effort with the Division of Information and Education.
- II.1.6: Modify management regime to conform with customer expectations.

PERFORMANCE INDICATORS

Inputs	Number of requests for assistance in constructing boating access facilities
	Number of fish requested for stocking from within and without the Department
	Number of requests for assistance in managing private waters
	Number of recreational fishers surveyed
Outputs	Number of boating access facilities approved for funding
	Number of fish stocked
	Number of pond owners receiving assistance in managing private waters
	Number of angler survey completion reports written
	The percentage of satisfied recreational fishers
Outcome	The number of boating access facilities started
	Percentage of stocking requests that were met
	Percentage of pond owners requesting assistance that received it
	Percent increase in the number of satisfied recreational fishers
Efficiency	Percent of available funds utilized for boating access
	Cost of providing advice to pond owners (\$/pond)
	Cost per unit of fish stocked

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OBJECTIVE II.2.

Increase commercial customer satisfaction by the year 2003.

STRATEGIES:

- II.2.1: Issue permits for participation in special fisheries in a timely manner.
- II.2.2: Conduct customer satisfaction survey each year.
- II.2.3: Modify management regime to conform with customer expectations where feasible.
- II.2.4: Interact with other agencies which impact Louisiana's fisheries.
- II.2.5: Collect annual rent and renewals fees for all oyster leases in accordance with all statutes, rules and regulations in a timely manner.
- II.2.6: Survey oyster lease applications and issue oyster leases in accordance with all statutes, rules and regulations in a timely manner.
- II.2.7: Administer statutorily authorized permit programs.

PERFORMANCE INDICATORS

Inputs	Number of requests for special fishery permits
	Number of new oyster lease applications requested
	Number of oyster lease renewal applications requested
	Number of requests received for scientific data
	Number of person-days spent coordinating Federal and Interstate management
Outputs	Number of special fishery permits issued
	Number of new oyster lease applications surveyed
	Number of requests for scientific data processed
	Number of renewal oyster lease applications surveyed
Outcome	Number of oyster lease renewals issued
	Number of new oyster leases issued
	Percentage of requested permits that were issued
Efficiency	Mean number of days required to issue special fishery permits
	Mean number of days required to issue new oyster leases
	Mean number of days required to fulfill scientific data requests

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OBJECTIVE II.3.

Establish, by the year 2003, maintenance control of nuisance aquatic plants that threaten the preservation, enhancement and utilization of aquatic habitat in public waterbodies by increasing present control capabilities of invasive, exotic plants by 100% from 32,500 acres to 65,000 acres.

STRATEGIES:

- II.3.1: Determine statewide infestations of problematic aquatic plants (water hyacinth, hydrilla, salvinia, alligator weed, etc.).
- II.3.2: Increase statewide aquatic plant control capabilities through approval of \$5 million of funding per new and expanded budget request.
- II.3.3: Investigate aquatic vegetation infestations in selected public lakes.
- II.3.4: Perform maintenance and control operations.

PERFORMANCE INDICATORS:

Inputs	Number of acres of nuisance aquatic plants Number of lakes requiring type mapping and biomass sampling to determine status of aquatic plant infestations
Outputs	Number of acres treated by species Number of lakes evaluated
Outcomes	Percent of infestations treated statewide Percent increase with initiation of expanded program Technical assistance to citizens Maintenance to public boat launches

ENFORCEMENT CASE REPORT

JANUARY 1999

REGION 1:

**PARISHES: BIENVILLE, BOSSIER,
CADDO, CLAIBORNE,
DESOTO, RED RIVER,
WEBSTER**

TOTAL CASES	106	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	7
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TOTAL	DESCRIPTION OF CITATION
20	Boating
10	Angling W/O A License
1	Angling W/O A License Non-Resident
13	Fishing W/O Resident Pole License
1	Use Gear W/O Recreational Gear License
2	Take Game Fish Illegally (Snagging)
1	Use Wire Net To Take Undersize Catfish
1	Take Over Limit Of Freshwater Game Fish (Crappie)
2	Caddo Lake (Yo-Yo Regulations)
8	Hunt W/O A Resident License
1	Failure To Abide By Commission Rules
1	Hunt From Moving Vehicle
1	Hunt W/Unplugged Gun
2	Hunt Across Public Road Or Road Right-Of-Way
4	Hunt, Stand, Loiter, From Public Road, Right-Way

TOTAL	DESCRIPTION OF CITATION
3	Hunt MGB W/O State Stamp
2	Failure To Comply W/Hunter Safety Regulations
1	Hunt W/O Resident Big Game License
1	Hunt Or Take Deer Illegal Hours
1	Failure To Comply With Hunters Orange Regulations
6	Hunt Ducks W/O Federal Stamp
2	Hunt MGB W/Unplugged Gun
4	Hunt MGB Illegal Hours
8	Using Lead Shot In Area Designated As Steel Shot
3	Possession Over Limit Ducks (Field Possession)
1	Hunt MGB W/O State Duck Stamp
4	Failure To Abide By Rules & Regulations On WMA
2	Operate ATV On Public Road

CONFISCATIONS:

CONFISCATION DESCRIPTION	
74 crappie, 14 ducks, several lead shot shells, 1 bass, 20 yo-yo's, 1 wire net, 48 channel catfish, 1 rifle.	

TOTAL OF EACH CATEGORY FOR REGION 1

TOTAL	DESCRIPTION
20	Boating
2	Commercial Fishing
24	Federal Migratory
0	Littering
2	Miscellaneous
29	Recreational Fishing
25	State Hunting/Trapping
4	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
6	Bodcau
1	Jackson-Bienville

REGION 2:

**PARISHES: E. CARROL, JACKSON,
LINCOLN, MOREHEAD,
QUACHITA, RICHLAND
UNION, W. CARROL**

TOTAL CASES	114	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	7
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TOTAL	DESCRIPTION OF CITATION
3	Failure To Comply With PFD Requirements
1	Fish Without Resident Pole License
12	Hunt Migratory Game Bird (MGB) Closed Season
2	Hunting With Unplugged Gun
9	No Federal Duck Stamp
2	Hunt Migratory Game Bird (MGB) With Unplugged Gun
8	Possess Untagged MGB
3	Operate ATV On Public Road
2	Aiding and Abetting
1	Failure To Comply With DMAP Regulations
9	Hunting Without A Resident License
1	Hunting Without A Resident Big Game License
1	Hunt/Take Deer From Public Road
3	Hunt From Public Road
1	Failure To Comply With Hunter Orange Regulations
3	Take Illegal Deer Open Season
2	Trespass or Hunt DMAP Lands
3	Littering
2	Careless Operation
2	Aggravated Assault Of Officer
1	Resist Officer
5	Hunt Without MGB State Stamp

TOTAL	DESCRIPTION OF CITATION
2	Obstruction Of Justice
2	Possession Of Illegally Taken Deer
2	Failure To Maintain Sex I.D. Of Deer
8	Posses Over Limit Of Ducks
3	Hunt Wild Quadrupeds Illegal Hours
2	Discharge Firearm From Public Road
2	Hunt Deer Illegal Hours
1	Use Lead Shot In Steel Shot Area
3	Hunt MGB Illegal Hours
1	Improper Running Lights
1	Hunt Turkey Closed Season
1	Transport Fully Dressed MGB
2	No Tail Light
7	Not Abide By Rules and Regulations on WMA
1	Hunt From Moving Vehicle

CONFISCATIONS:

CONFISCATION DESCRIPTION	
60-ducks, 1-Honda 300 ATV, 18-lead shots, 5-DMAP Tags, 5-deer, 5-rifles and scopes, 2-shotguns.	

TOTAL OF EACH CATEGORY FOR REGION 2

TOTAL	DESCRIPTION
4	Boating
-0-	Commercial Fishing
46	Federal Migratory
3	Littering
12	Miscellaneous
1	Recreational Fishing
41	State Hunting/Trapping
7	Not Abiding By Rules and Regulations on WMA

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
15	Public Assistance- Assisting Stranded Vehicles and Boaters

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
1	Russell Sage WMA
1	Ouachita WMA
-0-	Union WMA
3	Georgia Pacific WMA
2	Jackson-Bienville WMA

REGION 3:

**PARISHES: AVOUELLES, GRANT,
NATCHITOCHES, RAPIDES
SABINE, VERNON, WINN**

TOTAL CASES	175	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	18
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TOTAL	DESCRIPTION OF CITATION
9	Boating
6	Angling W/O Resident License In Possession
5	Hunt W/O Residential License (Basic)
1	Hunt W/O Residential Big Game License
6	Hunt Deer Illegal Hours
1	Take Illegal Deer Out Of Season
12	Hunt Deer From Public Road
11	Hunt From Moving Vehicle
1	Hunt Deer With Illegal Firearm (22MAG.)
9	Fail To Wear Hunters Orange
4	Hunt M.G.B. W/O State Stamp
2	Hunt Stand Loiter From Public Road
1	Hunt W/O Non-Resident Basic License
1	Hunt W/O Non-Resident State Duck Stamp
1	Hunt Squirrels Illegal Method (Rifle)

TOTAL	DESCRIPTION OF CITATION
3	Criminal Trespass
1	Simple Obstruction Of Highway
2	Field Possession Of Deer Meat W/O Tag
3	Fail To Maintain Sex I.D. (Deer)
1	Failure To Abide By Commission Rules
1	Possession Over Limit Of Deer
4	Hunting Quadrupeds Illegal Hours With Artificial Light
1	Littering
2	Hunt Raccoons Illegally
2	Possess Over Limit Of Game Fish (Black Bass)
14	Using Lead Shot In Area Designated As Steel Shot Only
8	Hunt Ducks W/O Federal Stamp
6	Hunt Ducks W/O State Stamp
16	Hunt MGB Illegal Hours
7	Take Over Limit Ducks
6	Hunt Ducks With Un-Plugged Gun
4	Wanton Waste Of MGB (Ducks)
4	Hunt Ducks W/O Basic License
4	Taking Robins – No Season

TOTAL	DESCRIPTION OF CITATION
2	Hunt Over Bait
2	Hunt W/O Season Permit (Catahoula G.M.A.)
4	Hunt From Public Road
5	Failure To Abide By Rules & Regulations
1	Bow Hunt W/O Bow License
2	Hunt Wild Quadrupeds Illegal Hours

CONFISCATIONS:

CONFISCATION DESCRIPTION
<p>20 black bass, 1 button buck deer, 1 doe deer, 22 d map tags and records, 103-12 ga lead shot, 39-20 ga lead shot, 1 stevens 22 cal rifle with scope, 4 hooded merganser, 54 wood ducks, 3 scaup duck, 1 ringneck duck, 5 mallards, 2 whole deer quartered, 1 cut up deer parts, 1 marlin 22 mag rifle, 1 box 22 mag bullets, 1 brinkman q-beam, 2 pictures of buck deer, 11 robins, 7 rabbits, 1 raccoon, 1 marlin 22 cal rifle, 1 blue max q-beam.</p>

TOTAL OF EACH CATEGORY FOR REGION 3

TOTAL	DESCRIPTION
9	Boating
0	Commercial Fishing
75	Federal Migratory
1	Littering
7	Miscellaneous
8	Recreational Fishing
70	State Hunting/Trapping
5	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
6	Camp Beauregard
6	Catahoula
6	Alexander State Forest

REGION 4:

**PARISHES: CALDWELL, CATAHOULA,
CONCORDIA, FRANKLIN,
LASALLE, MADISON, TENSAS**

TOTAL CASES	181	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	39
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TOTAL	DESCRIPTION OF CITATION
7	Boating
5	Angling W/O A License
2	Use Gear W/O Recreational Gear License
1	Sell And/Or Buy Fish W/O Wholesale/Retail Dealer's License
4	Sell And/Or Buy Fish Without A Retail Seafood Dealers License
1	Fail To Maintain Records
5	Hunting W/O Resident License
2	Failure To Abide By Commission Rules
11	Hunting From A Moving Vehicle
8	Hunt Wild Quadrupeds Illegal Hours
5	Hunt Across Public Road
5	Hunt From Public Road
11	Hunt MGB W/O State Stamp
2	Hunt W/O Resident Big Game License
7	Hunt Or Take Deer Closed Season

TOTAL	DESCRIPTION OF CITATION
2	Hunt Deer Illegal Methods (Magnified Scope On Muzzleloader)
2	Hunt Or Take Deer From Public Road
2	Hunt Or Take Illegal Deer Open Season
1	Hunt Or Take Deer W/Illegal Weapon
1	Possess Over Limit Of Deer
3	Possession Of Untagged Deer
2	Field Possession Of Deer Meat W/O Tag
3	Fail To Maintain Sex Identification
8	Failure To Comply W/Hunters Orange Regulations
3	Hunt W/O Muzzleloader License
1	Hunt Raccoons Illegally
14	Hunting Ducks W/O Federal Stamp
7	Hunting MGB With Unplugged Gun
14	Hunting MGB Illegal Hours
1	Wanton Waste Of MGB
17	Using Lead Shot In Area Designated As Steel Shot Only
2	Possess Over Limit Of Ducks (Field Possession)
18	Not Abiding By Rules & Regulations On WMA
1	Other Than Wildlife & Fisheries (Driving Under Suspension)

TOTAL	DESCRIPTION OF CITATION
2	Flight From An Officer
1	Discharge Firearm From Public Road

CONFISCATIONS:

CONFISCATION DESCRIPTION	
10 deer, 1 rabbit, 37 ducks, 5 rifles, 3 spotlights, 1 muzzleloader, 1 shotgun and 277 lead shot shells.	

TOTAL OF EACH CATEGORY FOR REGION 4

TOTAL	DESCRIPTION
7	Boating
0	Commercial Fishing
55	Federal Migratory
0	Littering
10	Miscellaneous
7	Recreational Fishing
84	State Hunting/Trapping
18	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
10	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
0	Big Lake WMA
4	Boeuf WMA
0	Buckhorn WMA
19	Dewey Wills WMA
10	Red River WMA
0	Sicily Island Hills WMA
6	Three Rivers WMA

REGION 5:

**PARISHES: ACADIA, ALLEN,
BEAUREGARD, CALCASIEU,
CAMERON, EVANGELINE,
JEFF DAVIS, VERMILLION**

TOTAL CASES	273	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	19
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TOTAL	DESCRIPTION OF CITATION
12	Boating
9	Angling W/O A License
3	Angling W/O A Non. Res. License
2	Use Gear W/O Recreational Gear License
1	Poss/Take Undersize Red Drum
11	Poss/Take Undersize Black Drum
2	Take or Poss. Commercial Fish W/O Comm. Gear Lic
2	Take or Poss. comm. Fish W/O Vessel Lic.
1	Transport W/O Required License (Res/Non Res.)
2	Blocking Passage Of Fish
1	Use Illegal Length Mesh
1	Take/Poss. Undersize Black Drum (Comm.)
1	Poss. Or sell Undersize Crabs (Comm.)
3	Take Or Poss. Undersize White Shrimp
10	Hunting W/O A Res. License

TOTAL	DESCRIPTION OF CITATION
2	Hunting W/O Non. Res. Hunting License
9	Hunting From A Moving Vehicle
6	Hunting Quadrupeds Illegal Hours
6	Hunting From Public Road
2	Hunting MGB W/O State Stamp
1	Hunting W/O Res. Big Game License
2	Hunting Or Taking Illegal Deer Open Season
2	Poss. Illegally Taken Deer Open Season
2	Hunting W/O Muzzleloader license
2	Hunting On DMAP Lands W/O Permit Form
1	Failure To Tag Deer Meat
3	Hunting Raccoons Illegally
9	Hunting Ducks/Geese W/O Federal Stamp
6	Hunting MGB W/Unplugged Gun
26	Hunting MGB Illegal Hours
6	Hunting MGB Over Baited Area
23	Hunting MGB From A Vehicle
4	Wanton Waste of MGB
17	Using Leadshot In Steel Shot Only Area

TOTAL	DESCRIPTION OF CITATION
2	Poss. Of Live MGB – Illegally
11	Hunting MGB W/Electronic Calling Device
3	Overlimit Of Geese/Aiding and Abetting
2	Overlimit Of Geese
6	Overlimit Of Ducks
4	Taking Robins No Season
2	Poss. Of Other Than Non Game Birds No Season
1	Poss. Of Other Than Non Game Birds N/S – Aiding and Abetting
2	Hunting MGB W/O A State Hunting License
4	Hunting MGB W/O State Stamp
21	Hunting MGB From Public Road
10	Not Abiding By Rules And Regulations On Refuge No Wake Zone/ Closed Area
2	Criminal Trespass On State Property
4	Poss. of Marijuana
3	Littering
2	Other Than WLF
2	Trespass
1	Operate ATV On Public road
1	Flight From An Officer

CONFISCATIONS:

CONFISCATION DESCRIPTION	
<p>. 12 Turtles Return To Water, 9 Bass, 1 crappie, 1 Redfish, 95 Black Drum Return To Water, 1,714 lbs of Shrimp Sold for \$1,286.25, 2 Hoop Nets, 2 Lead Nets, 2 Marijuana Cigarettes, 8 Pieces of cigarette paper, 12 Robins, 153 Geese, 49 Ducks, 61 Shotgun Shells, 2 Electronic Callers w/Tapes, 2 Rabbits, 2 Doe Deer and 40 lbs of Deer Meat, 1-16' Fresh Water Seine.</p>	

TOTAL OF EACH CATEGORY FOR REGION 5

TOTAL	DESCRIPTION
12	Boating
13	Commercial Fishing
151	Federal Migratory
3	Littering
12	Miscellaneous
26	Recreational Fishing
46	State Hunting/Trapping
10	WMA Rules and Regulations - Note (the other 9 cases are under Recreational fishing made on state refuges)

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TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
0	State Wildlife
0	Marsh Island
19	Rockefeller Refuge
0	West Bay
0	Marshy Bayou

REGION 6:

**PARISHES: IBERIA, IBERVILLE,
LAFAYETTE, PT. COUPEE,
ST. LANDRY, W.B. ROUGE**

TOTAL CASES	166	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	6
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TOTAL	DESCRIPTION OF CITATION
34	Boating
14	Angling W/O A License
1	Hunting W/O Resident Big Game License
6	Hunting W/O Resident License
4	Hunt Raccoons Illegally
11	Hunt From Moving Vehicle
6	Hunt Wild Quadruped Illegal Hours
2	Hunt From Public Road
2	Hunt Or Take Illegal Deer Open Season
6	Fail to Comply With Hunter Safety Regulations
1	Hunt MGB W/O State Stamp
7	Hunt From Public Road
8	Hunt/Take Deer Illegal Hours
4	Hunt With Unplugged Gun
1	Hunting W/O Non-Resident License
2	Fail to Maintain Sex Identification

TOTAL	DESCRIPTION OF CITATION
1	Possession Over Limit of Deer
1	Possession Of Illegally Taken Deer Open Season
1	Possession Of Untagged Deer
1	Fail To Wear Hunter Orange
1	Fail To Maintain Records
1	Buy Or Sell Fish W/O Retail Seafood License
1	Failure To Mark/Tag Nets
1	Sell And Buy Fish W/O Retail Seafood License
1	Hunt MGB With Unplugged Gun
8	Hunt Ducks W/O Federal Stamp
8	Hunt Ducks W/O State Stamp
8	Use Leadshot In Area Designated As Steel Shot Only
2	Wanton Waste Of MGB
11	Hunt MGB Illegal Hours
4	Hunt MGB W/O State Hunting License
1	Possession Of Stolen Things
1	Littering
1	Not Abiding By Rules/Regulations On WMA
2	Not Abiding by Rules/Regulations On State Land

TOTAL	DESCRIPTION OF CITATION
2	Use Of Dogs For Hunting

CONFISCATIONS:

CONFISCATION DESCRIPTION
1 invoice, 55 shotgun shells, 7 deer, 2 coots, 5 rabbits, 2 raccoons, 1 ice chest, 1 – 4-wheeler, 1 rifle, 1 beer can, 1 shotgun, 2 pintails, 2 mallards

TOTAL OF EACH CATEGORY FOR REGION 6

TOTAL	DESCRIPTION
34	Boating
4	Commercial Fishing
42	Federal Migratory
1	Littering
3	Miscellaneous
14	Recreational Fishing

67	State Hunting/Trapping
1	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
0	Thistlethwaite Wildlife Management Area
0	Sherburne Wildlife Management Area
6	Attakapas Wildlife Management Area

REGION 7:

**PARISHES: ASCENSION, E.B. ROUGE,
E. FELICIANA, LIVINGSTON,
ST. HELENA, ST. TAMMANY,
TANGIPHOA**

TOTAL CASES	134	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	6
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TOTAL	DESCRIPTION OF CITATION
9	Boating
5	Angling W/O A License
2	Failure to Maintain Sex Identification
3	Hunt With Unplugged Gun
4	Hunt Without Resident Big Game License
5	Hunt Without Resident Basic License
1	Poss. Of Illegally Taken Deer
1	Poss. Over Limit Of Deer
12	Failure To Wear Hunter Orange
1	Take Robins No Season
2	Running Deer Dogs During Still Hunt Only
8	Deer Hunt From Public Road
1	Take Game Fish Illegally
1	Sell Shrimp Without Wholesale/Retail License
1	Failure To Maintain Records

TOTAL	DESCRIPTION OF CITATION
1	Use Recreational Gear Without License
11	Hunt From Moving Vehicle
8	Hunt From Public Road
8	Hunt Deer At Night
3	Hunt Deer Illegal Methods
3	Hunt M G B Without State Stamp
5	Hunt M G B Without Federal Stamp
3	Hunt M G B With Lead Shot
2	Hunt M G B Closed Season
1	Possession Over Limit of M G B
1	Discharge Firearm From Public Road
2	Hunter Safety Violations
1	Packaging Oysters Without Permit
2	Hunt Without Non-Resident License
2	Take Illegal Deer Open Season
1	Take Rabbit At Night
1	Hunt without Non-Resident Muzzle Loader License
4	Not Abiding By Rules & Regulations on W M A
19	Injuring Public Records

CONFISCATIONS:

CONFISCATION DESCRIPTION	
2 shotguns, 1 rifle, 1-Q beam, 5 deer, 3 rabbits, 6 wood ducks, 2 jars of oysters.	

TOTAL OF EACH CATEGORY FOR REGION 7:

TOTAL	DESCRIPTION
9	Boating
3	Commercial Fishing
12	Federal Migratory
0	Littering
19	Miscellaneous
7	Recreational Fishing
80	State Hunting/Trapping
4	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
2	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
5	Pearl River W MA
1	Ben's Creek W M A

REGION 8:

**PARISHES: JEFFERSON, ORLEANS,
PLAQUEMINE, ST. BERNARD,
ST.CHARLES**

TOTAL CASES	143	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	35
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TOTAL	DESCRIPTION OF CITATION
13	Boating
18	Angling W/O A License
6	Angling W/O A Non-Resident License
5	Angling W/O A Saltwater License
11	Take/Possess Over The Limit Of Red drum
2	Possess Over 10 Red Drum (Off Water)
5	Take/Possess Undersized Red Drum
1	Take/Sell Commercial Fish W/O A Commercial License
1	Take Commercial Fish W/O Commercial Gear License
1	Sell / Buy Fish W/O Wholesale/Retail Dealer's License
1	Sell/ Buy Fish W/O A Retail Seafood Dealer's License
2	Fail To Maintain Records
1	Transport W/O Required License
1	Fail To Comply With Commission Rules And Regulations Concerning Traversing Permit
2	Take/Possess Undersize Commercial Finfish (Catfish)

TOTAL	DESCRIPTION OF CITATION
2	Failure To Out Oyster Tags Correctly
3	Failure To Tag Sacked Or Containerized Oysters
2	Buying Or Selling For Resale Untagged Oysters
2	Violation Of Sanitary Code –Chapter 9(Fail To Refrigerate Properly)
3	Adulterated Foods
2	Fail To Abide By Commission Rules And Regulations(Hunt In Closed Area)
1	Hunt W/O Resident Big Game License
3	Hunt/ Take Deer Illegal Hours
2	Possess Fur Bearing Animals W/O A License
4	Hunt Ducks W/O A Federal Stamp
3	Hunt MGB With Unplugged Gun
2	Hunt MGB Over Baited Area
1	Rallying MGB
3	Transport Completely Dressed MGB
1	Wanton Waste Of MGB
7	Using Lead Shot In Area Designated As Steel Shot Only
1	Possess Over The Limit Of Coots
3	Possess Over The Limit Of Ducks
1	Take Robins-No Season

TOTAL	DESCRIPTION OF CITATION
3	Hunt MGB W/O State Duck Stamp
3	Hunt MGB W/O State Hunting License
13	Not Abiding By Rules And Regulations On WMA
1	Illegal Possession Of Marijuana
1	Littering
2	Reckless Operation Of A Motor Vehicle
2	Passing Stopped School Bus
1	Violate General Speed Law
1	Resist An Officer
1	Simple Escape

CONFISCATIONS:

CONFISCATION DESCRIPTION
<p>Seafood and game donated: deer---2: ducks---38:coots---48:spotted sea trout---15:white trout---15:bonita---2:king mackerel---2:flounder---31:black drum---13:red drum---100:croaker---150 pounds: seafood returned to water:red drum---8:black drum---12:sheepshead---20:spotted sea trout---2: seafood sold: black drum---1977 pounds sold for \$1,257.50 -sheepshead---27 pounds sold for \$9.45. seafood destroyed: oysters---18 sacks:shucked oysters---9 quarts: black drum---15: red drum---5: Hardware confiscated: shotguns---3: boats---1: motor---1. Gill nets---900 feet. Unattended gill net---1500 feet:lead shot shotgun shells---64:ice chests---2</p>

TOTAL OF EACH CATEGORY FOR REGION 8

TOTAL	DESCRIPTION
13	Boating
22	Commercial Fishing
32	Federal Migratory
1	Littering
7	Miscellaneous
47	Recreational Fishing
8	State Hunting/Trapping
13	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
#0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
15	Salvador
3	Biloxi
17	Pass a Loutre

REGION 9:

**PARISHES: ASSUMPTION, LAFOURCHE,
ST. JAMES, ST. JOHN,
ST. MARTIN, ST. MARY,
TERREBONNE**

TOTAL CASES	289	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	46
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TOTAL	DESCRIPTION OF CITATION
55	Boating
37	Angling W/O A License
12	Angling W/O A License Non-Resident
14	Angling W/O Saltwater License
1	Angling W/O Saltwater License Non-Resident
2	Taking Over Limit Freshwater Gamefish (Crappie)
3	Take O/L Of Red Drum
3	Possess Over 10 Red Drum (Off Water)
1	Possess O/L Red Drum In Excess Of 27" Recreational
2	Fail To Have Intact (Saltwater)
18	Take Undersized Red Drum
20	Take Undersized Black Drum (Recreational)
6	Take O/L Black Drum (Recreational)
2	Take Commercial Fish W/O Commercial License
1	Take Commercial Fish W/O Commercial Gear License (Crawfish)

TOTAL	DESCRIPTION OF CITATION
1	Use Crab Traps W/O Required Markings
1	Violate Crab Trap Escape Ring Requirements
1	Fail To Mark Oyster Lease While Harvesting
4	Hunting W/O Resident License
2	Hunting From Moving Vehicle
4	Hunt Wild Quadrupeds Illegal Hours With Artificial Lights
3	Fail To Comply W/Hunter Safety Regulations
2	Hunt W/O Resident Big Game License
5	Take Illegal Deer Open Season
1	Possess O/L Of Deer
4	Fail To Wear Hunters Orange
5	Violation Of DMAP Program Failure To Tag Deer
6	Hunting Ducks W/O Federal Stamp
2	Hunting With Unsigned Duck Stamp
1	Hunting MGB With Unplugged Gun
3	Hunting MGB Illegal Hours
6	Possess Untagged MGB
1	Possession Of Completely Dressed MGB (No Wing Tip Left On)
14	Using Lead Shot In Area Designated As Steel Shot Only

TOTAL	DESCRIPTION OF CITATION
5	Possess Over Limit Of Ducks
2	Hunting Gallinules Closed Season
1	Taking Robins – No Season
1	Taking Of Other Non-Game Birds – No Season
3	Hunt MGB Without State Stamp
3	Hunt MGB Without State Hunting License
14	WMA
3	Obtain License By Fraud
1	Fish W/O Resident Pole License
1	CML Fisherman Sell To Other than Wholesale/Retail Dealer
1	Sell Fish W/O Wholesale/Retail License
1	Fail To Maintain Records
1	Buy Commercial Fish From Un-Licensed Fisherman
2	Failure To Fill Out Oyster Tags Correctly
2	Selling For Resale Untagged Oysters
1	Hunting W/Unplugged Gun
1	Hunt W/O Non-Resident Big Game License
1	Take Deer W/Illegal Weapon
1	Possessing FBA W/O License

TOTAL	DESCRIPTION OF CITATION
1	Driving W/O Operators License

CONFISCATIONS:

CONFISCATION DESCRIPTION
5 redfish, 1 catfish, 75 black drum, 96 red drum, 3 speckled trout, 51 teal ducks, 28 scaup, 4 bass, 1 garfish, 2 bags filet fish, 1 pintail duck, 16 mallards, 11 gadwalls, 7 redhead ducks, 8 shovellers, 3 mottled duck, 2 black ducks, 1 widgeon, 1 galinule, 4 coots, 7 deer, 133 crappies, 1 cattle egret, 3 robins, 28 duck breasts, 1 raccoon sold for \$1.50, 17 nutrias sold for \$35.75, 1 pellet gun, 3 rifle w/clip and sling, 2 aluminum boats, Johnson 48 hp motor, 3 marine batteries, 1 trailer, 2 gas tank, 1 headlight w/battery, 1 ice chest, various rifle shells and shotgun shells, 1 gun case, 25hp mariner, 8 sacks oysters, 7 oyster tags, 1 resident hunting license, 1 state duck stamp, 2 boxes shotgun shells, 1 basic fishing license, 1 saltwater license

TOTAL OF EACH CATEGORY FOR REGION 9

TOTAL	DESCRIPTION
55	Boating
14	Commercial Fishing
48	Federal Migratory
0	Littering
4	Miscellaneous
120	Recreational Fishing

34	State Hunting/Trapping
14	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
2	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
38	Pointe Aux Chenes
8	Atchafalaya Delta

S.W.E.P. – PATROL COASTAL WATERS

TOTAL CASES	52	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	0
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TOTAL	DESCRIPTION OF CITATION
5	Boating
1	Use Trawls Exceeding Size Requirements
1	Transport W/O Required License
1	Illegal Shipping Of Commercial Finfish
1	No Vessel License
1	Possess Over Limit Of Red Drum Exceeding 27"
12	Possess Undersize Black Drum
10	Possess Undersize Red Drum
11	Possess Over Limit Of Red Drum
4	Possess Over Limit Of Black Drum
4	Angling W/O A Non-Resident License
1	Take Commercial Fish W/O Commercial Gear License

CONFISCATIONS:

CONFISCATION DESCRIPTION	
7,518 lbs. of shrimp seized sold for \$37,408.00, 111 red drum, 28 black drum.	

TOTAL OF EACH CATEGORY FOR S.W.E.P.

TOTAL	DESCRIPTION
5	Boating
5	Commercial Fishing
42	Sport Fishing
0	Littering
0	Miscellaneous
0	DUI

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
0	

SPECIAL NOTE: TOTAL ENGINE HOURS: 148
TOTAL BOATS CHECKED: 158

REGION –STATEWIDE STRIKE FORCE

PARISHES: STATEWIDE

TOTAL CASES	76	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	47
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TOTAL	DESCRIPTION OF CITATION
11	Boating
4	Angling W/O A License
1	Angling W/O A Saltwater License
2	Sell And Or Buy Fish W/O Wholesale/Retail License
1	Buying Or Selling Untagged Oysters
5	Hunting W/O Resident License
1	Hunting From A Moving Vehicle
2	Hunting With Unplugged Gun
1	Hunt Wild Quadrupeds Illegal Hours W/Artificial Light
1	Fail To Comply With Hunter Safety Regs.
1	Hunt W/O Resident Big Game License
1	Hunt W/O Non-Resident Big Game License
1	Hunt Deer Illegal Hours W/Artificial Light
3	Hunt Ducks Or Geese W/O Federal Stamp
1	Hunting With Unsigned Duck Stamps
4	Hunt MGB Illegal Hours
2	Possess Untagged MGB
8	Use Lead Shot In Area Designated As Steel Shot Only
4	Possess Over Limit Of Ducks
2	Hunt MGB W/O State Duck Stamp
2	Hunt MGB W/O State Hunting License
11	Not Abiding By Rules And Regs. On WMA
1	Littering

TOTAL	DESCRIPTION OF CITATION
1	Other Than Wildlife And Fisheries
2	Operate ATV On Public Road
2	Obtain License By Fraud
1	Violation Of Sanitary Code

CONFISCATIONS:

CONFISCATION DESCRIPTION
71 ducks, 4 rabbits, 1 deer, 19 sacks of oysters, 2 jars of oysters, 169 lead shot shells, 1998 Four Wheeler, .22 rifle, 1 resident hunting license, 1 resident duck stamp.

TOTAL OF EACH CATEGORY FOR STATEWIDE STRIKE FORCE

TOTAL	DESCRIPTION
11	Boating
3	Commercial
26	Federal Migratory
1	Littering
6	Miscellaneous
5	Recreational Fishing
13	State Hunting/Trapping
11	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
42	Point-Au-Chenes
3	Bodcau

REGION -SEAFOOD INVESTIGATIVE UNIT**PARISHES: STATEWIDE**

TOTAL CASES	32	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	0
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TOTAL	DESCRIPTION OF CITATION
9	Angling W/O A Basic License
3	Angling W/O A Saltwater License
1	Possess Over 10 Red Drum
4	Take/Possess Undersized Red Drum
2	Take/Possess Undersized Black Drum
1	Use Crab Trap W/O Required Markings
1	Violate Crab Trap Escape Ring Requirements
2	Take/Possess Commercial Fish W/O Vessel License
5	Fail To Maintain Records
3	No Wholesale/Retail Dealers License
1	Other Than Wildlife And Fisheries

CONFISCATIONS:

CONFISCATION DESCRIPTION
45 red drum, 8 black drum, 1,518 lbs. of shrimp sold for \$1,404.

TOTAL OF EACH CATEGORY FOR SEAFOOD INVESTIGATIVE UNIT

TOTAL	DESCRIPTION
0	Boating
10	Commercial Fishing
0	Federal Migratory
0	Littering
0	Miscellaneous
21	Recreational Fishing
0	State Hunting/Trapping
1	WMA Rules and Regulations

TOTAL NUMBER FOR PUBLIC ASSISTANCE

TOTAL	DESCRIPTION
0	Public Assistance

TOTAL NUMBER OF CASES MADE ON WMAs AND REFUGES

TOTAL	NAME OF MANAGEMENT AREA
0	

REGION –OYSTER STRIKE FORCE**PARISHES: STATEWIDE**

TOTAL CASES	26	WILDLIFE MANAGEMENT AREA (WMA) & REFUGES	0
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TOTAL	DESCRIPTION OF CITATION
1	Boating
1	Failure To Mark Oyster Lease Prior To Fishing
2	Pre-Packaging Shucked Oysters Without Proper Certification
1	Take Oysters From Unapproved Area
3	Buying/Selling Oysters Without Wholesale Dealer's License
2	Failure To Maintain Records On Sales/Purchases Of Oysters
4	Failure To Fill Out Oyster Tags Correctly
4	Buy And Sell Untagged Oysters
1	Buy Oysters From Unlicensed Fisherman
1	Sell Oysters W/O Commercial Fisherman's License
1	Sell Oysters To An Unlicensed Wholesale Dealer
2	Angling W/O A Basic Resident License
1	Fishing W/O A Saltwater License
1	Take Undersize Black Drum
1	Take Undersize Red Drum

CONFISCATIONS:

CONFISCATION DESCRIPTION
24 sacks of oysters, 6 pints of oysters, 4 quarts of oysters, 4 black drum, 2 red drum.

TOTAL OF EACH CATEGORY FOR OYSTER STRIKE FORCE

TOTAL	DESCRIPTION
1	Boating
20	Commercial Fishing
0	Federal Migratory
0	Littering
0	Miscellaneous
5	Recreational Fishing
0	State Hunting/Trapping
0	WMA Rules and Regulations

<u>TOTAL CASES WMA AND REFUGES</u>	<u>- 183</u>
<u>TOTAL CASES</u>	<u>-1581</u>

ENFORCEMENT AVIATION REPORT
JANUARY, 1999

185-Amph. - 61092
Hrs. - 38.1

185-Float - 9667Q
Hrs. -

210 - 9467Y
Hrs. - 23.3

Enforcement Hours - 34.6

Other Divisions - 26.8

Total Plane Use - 61.4

W 000426 STATE OF LOUISIANA
DEPARTMENT OF WILDLIFE AND FISHERIES
ENFORCEMENT DIVISION

Parish of _____ 1. Code No. _____
Region No. _____ Parish Code No. _____ Employee No. _____ 2. Code No. _____
3. Code No. _____

VIOLATION/WARNING

On the _____ day of _____, 19____ at _____ M.,

Name _____

Address _____

City _____ State _____

Date of Birth _____ Occupation _____

Race _____ Sex _____ Ht. _____ Wt. _____ Hair _____ Eyes _____

Dr. Lic. No. _____ SS No. _____

Committed the following offense(s), section(s) or rule(s):

1. RS _____

2. RS _____

3. RS _____

Namely at _____

Signature and Employee No. _____

AGENT'S INSTRUCTIONS OR COMMENTS

Signed By _____

Name

Last

First

Middle

W 000426

W 000426 STATE OF LOUISIANA
DEPARTMENT OF WILDLIFE AND FISHERIES
ENFORCEMENT DIVISION

Parrish of _____ 1. Code No. _____
Region No. _____ Parrish Code No. _____ Employee No. _____ 2. Code No. _____
3. Code No. _____

VIOLATION/WARNING

On the _____ day of _____, 19 _____ at _____ M.,

Name _____

Address _____

City _____ State _____

Date of Birth _____ Occupation _____

Race _____ Sex _____ Ht. _____ Wt. _____ Hair _____ Eyes _____

Dr. Lic. No. _____ SS No. _____

Committed the following offense(s), section(s) or rule(s):

1. RS _____

2. RS _____

3. RS _____

Namely at _____

Signature and Employee No. _____

AGENT'S INSTRUCTIONS OR COMMENTS

Signed By _____

Jan 17 -

Warm / Dry

60 day 6

$$\left(\frac{3.5}{2.6} \right) 12/11$$

836,000 - Packer*

$$\left(\frac{3.3}{3.8} \right)$$

790

$$\begin{array}{r} 102 \\ 790 \\ \hline 892 \end{array} \checkmark$$

$$\begin{array}{r} 22 \\ 31 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 128 \\ 96 \\ \hline 224 \\ 168 \end{array}$$

$$\frac{2 \text{ mm coarse}}{3.1 \text{ mm}}$$

$$\begin{array}{r} 12/16 \\ \hline 381 \end{array}$$

Gravels
Loss of Material

MONTHLY CIVIL RESTITUTION REPORT

PERIOD	NO. CASES	AMOUNT	CREDIT FOR NO. CASES	AMOUNT	DISCOUNTS	Percent	Percent
	ASSESSED	ASSESSED	SALE GOODS	PAID	PAID	TAKEN	Dollars Paid Cases Paid
FISCAL YEAR 1993-94							
July, 1993	25	21,039	(9,778)	29	4,855	2,545	
Aug., 1993	53	44,922	(1,137)	41	7,950	3,603	
Sept., 1993	42	137,635	(17,938)	35	6,783	3,048	
Oct., 1993	49	21,471	(11,282)	40	3,285	1,519	
Nov., 1993	57	31,207	(13,260)	32	3,053	2,845	
Dec., 1993	53	13,777		27	6,507	6,713	
Jan., 1994	38	18,918		32	4,423	2,831	
Feb., 1994	68	38,131	(8,238)	46	9,124	5,993	
Mar., 1994	38	22,739	(2,482)	51	10,854	6,796	
April, 1994	14	44,732	(1,404)	27	7,307	4,632	
May, 1994	10	4,504	(165)	7	5,447	3,808	
June, 1994	29	26,167	(2,986)	12	1,886	1,214	
Total FY 1994	476	425,242	(68,670)	379	71,474	45,547	27.5% 79.6%
FISCAL YEAR 1994-95							
July, 1994	17	2,127	(335)	23	2,101	1,437	
Aug., 1994	41	96,403	(3,035)	20	1,010	605	
Sept., 1994	34	14,614	(14,002)	26	2,596	2,342	
Oct., 1994	94	17,426	(8,677)	38	2,922	3,179	
Nov., 1994	43	103,592		45	3,992	2,803	
Dec., 1994	68	31,400		35	4,315	2,329	
Jan., 1995	55	27,601		52	7,493	4,921	
Feb., 1995	70	61,119		41	6,472	3,973	
Mar., 1995	31	25,072		44	8,315	4,737	
Apr., 1995	13	15,353		16	3,565	1,538	
May., 1995	23	11,632		16	4,315	654	
June 1995	45	31,008		18	2,630	1,025	
Total FY 1995	534	437,347	(26,049)	374	49,726	29,543	18.1% 70.0%
FISCAL YEAR 1995-96							
July, 1995	0	0					
Aug., 1995	46	17,425		27	9,028	1,729	
Sept., 1995	1	125		21	3,093	2,049	
Oct., 1995	122	206,244		29	2,720	1,161	
Nov., 1995	55	23,124		62	10,151	6,383	
Dec., 1995	50	18,607		32	4,781	2,803	
Jan., 1996	49	13,815	(15,298)	36	5,297	3,473	
Feb., 1996	50	14,717		38	5,778	3,417	
Mar., 1996	33	24,937		36	6,035	3,422	
Apr., 1996	30	11,007		36	7,173	2,712	
May., 1996	23	7,989		24	3,942	2,020	
June 1996	50	22,151		16	2,790	1,182	
Total FY 1996	509	360,141	(15,296)	357	60,787	30,350	25.3% 70.1%
FISCAL YEAR 1996-97							
July, 1996	40	71,894		32	5,250	2,948	
Aug., 1996	32	5,363		32	6,255	3,784	
Sept., 1996	41	7,210		29	2,260	1,327	
Oct., 1996	29	11,093		25	3,698	2,262	
Nov., 1996	20	10,009		22	1,625	698	
Dec., 1996	13	238,466		22	5,877	2,122	
Jan., 1997	27	11,755		17	4,393	2,377	
Feb., 1997	47	18,521		42	8,580	5,553	
Mar., 1997	26	13,434		27	5,000	2,758	
Apr., 1997	10	2,909		15	2,323	1,299	
May., 1997	20	11,683		15	5,199	1,399	
June 1997	5	8,037		10	2,335	765	
Total FY 1997	310	410,373	0	288	52,794	27,290	19.5% 92.9%
FISCAL YEAR 1997 - 98							
July, 1997	10	2,812		8	1,585	823	
Aug., 1997	14	8,741		8	1,496	779	
Sept., 1997	29	19,926		12	2,052	1,278	
Oct., 1997	12	4,717		23	3,185	2,064	
Nov., 1997	23	54,965		10	2,425	1,218	
Dec., 1997	25	36,881		15	4,377	2,776	
Jan., 1998	42	30,026		17	5,300	3,534	
Feb., 1998	37	31,165		29	22,962	8,501	
Mar., 1998	9	13,273		32	9,407	4,372	
Apr., 1998	10	5,628		10	2,603	1,280	
May., 1998	0	225		8	2,885	950	
June 1998	5	2,414		6	1,042	98	
Total FY 1998	216	210,774	0	178	59,317	27,673	41.3% 82.4%
FISCAL YEAR 1998 - 99							
July, 1998	9	1,390		8	1,964	717	
Aug., 1998	10	2,241		10	1,048	372	
Sept., 1998	8	2,769		11	2,000	1,148	
Oct., 1998	22	28,705		14	1,860	807	
Nov., 1998	19	9,138		11	1,766	1,092	
Dec., 1998	23	11,959		27	4,441	2,041	
Jan., 1999	41	21,180		18	6,622	3,838	
Feb., 1999							
Mar., 1999							
Apr., 1999							
May., 1999							
June 1999							
Total FY 1999	132	77,381	0	99	19,702	10,016	38.4% 75.0%

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
CIVIL RESTITUTION ACTIVITY REPORT

DATE: 29-JAN-1999

CURRENT MONTH 01/01/1999 TO 01/31/1999 FISCAL YEAR TO DATE 07/01/1998 TO 01/31/1999

INCEPTION TO DATE 01/31/1999

ORIG RESTITUTION VALUES ENTERED
HEARING COSTS ASSESSED
SALE OF CONFISCATED COMMODS
SALES EXCEEDING RESTITUTION

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
41	\$21,129.55	132	\$76,881.38	3,725	\$2,546,538.87
2	\$50.00	19	\$475.00	169	\$4,225.00
0	\$0.00	0	\$0.00	331	\$269,865.45
0	\$0.00	0	\$0.00	148	\$71,951.21

RESTITUTION ASSESSED

41	\$21,179.55	132	\$77,356.38	3,725	\$2,352,849.63
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PAYMENTS
DISCOUNTS FOR TIMELY PAYMENTS
OVERPAYMENTS
REFUND OF OVERPAYMENT
APPLIED CONFISCATED COMMODS
APPLIED EXCEEDING BALANCE DUE
REFUND OF CONFISCATED COMMOD.
RETURNED CHECKS
MISC. ADJUSTMENTS
DEBITS
CREDITS
REASSESSMENTS
DEBITS
CREDITS
WRITE-OFFS
ASSESSMENTS WITHDRAWN
ADJUDICATION ADJUSTMENTS
FOUND NOT RESPONSIBLE
CASES VOIDED BY ENFORCEMENT

** TOTAL OUTSTANDING

0	\$0.00	1	\$309.52	20	\$6,877.19
1	\$524.54	3	\$2,289.52	57	\$36,384.98
0	\$0.00	0	\$0.00	207	\$138,113.64
0	\$0.00	0	\$0.00	6	\$1,399.24
0	\$0.00	0	\$16.00	0	\$4,279.59
1	\$140.00	2	\$44,940.60	31	\$72,873.50
0	\$0.00	0	\$0.00	0	\$0.00
				1,061	\$1,565,469.39

FOOTNOTE:

PAYMENTS FROM COLLECTION EFFORT
AMOUNT PAID TO COLLECTOR
FORFEIT OF CONFISCATED COMMODS

0	\$0.00	4	\$100.00	62	\$11,194.67
0	\$0.00	1	\$25.00	3	\$2,798.66
0	\$0.00		\$0.00	3	\$3,202.60

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
CLASS I ACTIVITY REPORT

DATE: 29-JAN-1999

	CURRENT MONTH 01/01/1999 TO 01/31/1999		FISCAL YEAR TO DATE 07/01/1998 TO 01/31/1999		INCEPTION TO DATE 01/31/1999	
	# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
FINES						
HEARING COSTS	509	\$25,850.00	4,799	\$243,500.00	68,792	\$3,498,697.07
DEBITS	265	\$6,625.00	903	\$22,575.00	15,437	\$386,175.00
CREDITS	0	\$0.00	2	\$150.00-	2	\$4,075.00-
		=====		=====		=====
TOTAL DUE		\$32,475.00		\$265,925.00		\$3,880,797.07

PAID IN FULL	317	\$18,705.00-	3,057	\$162,403.11-	37,508	\$1,941,153.67-
PARTIAL PAYMENTS	8	\$375.00-	58	\$2,728.00-	1,095	\$49,514.97-
OVERPAYMENTS	4	\$130.00	32	\$2,325.75	752	\$22,710.34
REFUNDS	3	\$105.00	23	\$875.00	130	\$6,804.31
RETURNED CHECKS	0	\$0.00	3	\$150.00	56	\$3,000.00
MISC CHANGES						
DEBITS	0	\$0.00	3	\$60.00	56	\$945.00
CREDITS	0	\$0.00	6	\$4.64-	162	\$151.23-
ADJUSTMENTS TO VIOLATION						
DEBITS	0	\$0.00	2	\$100.00	112	\$6,700.00
CREDITS	0	\$0.00	0	\$0.00	14	\$800.00-
VOIDS	30	\$1,200.00-	429	\$17,550.00-	3,721	\$157,975.73-
NOT GUILTY	3	\$150.00-	20	\$200.00-	568	\$28,275.00-
						=====

TOTAL OUTSTANDING

\$1,743,086.12

AGING OF OUTSTANDING CASES
FROM CITATION DATEAGING OF OUTSTANDING CASES
FROM HEARING DATE

	CURRENT	PRE HEARING	OVER 1 YEAR UNCOLLECTABLE	OVER 1 YEAR PENDING	OVER 1 YEAR (OTHER)
1 - 30 DAYS	275	1,277			
31 - 90 DAYS	270	2,805			
91 - 180 DAYS	654	563			
181 - 365 DAYS	762	631			
OVER 1 YEAR UNCOLLECTABLE	1,834	720			
OVER 1 YEAR PENDING	0	0			
OVER 1 YEAR (OTHER)	0	0			
	23,864	21,663			
	\$1,531,386.12	\$1,414,646.12			

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
CIVIL RESTITUTION ACTIVITY REPORT

DATE: 29-JAN-1999

CURRENT MONTH 01/01/1999 TO 01/31/1999 FISCAL YEAR TO DATE 07/01/1998 TO 01/31/1999 INCEPTION TO DATE 01/31/1999

ORIG RESTITUTION VALUES ENTERED
HEARING COSTS ASSESSED
SALE OF CONFISCATED COMMODS
SALES EXCEEDING RESTITUTION

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
41	\$21,129.55	132	\$76,881.38	3,725	\$2,546,538.87
2	\$50.00	19	\$475.00	169	\$4,225.00
0	\$0.00	0	\$0.00	331	\$269,865.45-
0	\$0.00	0	\$0.00	148	\$71,951.21

RESTITUTION ASSESSED

PAYMENTS
DISCOUNTS FOR TIMELY PAYMENTS
OVERPAYMENTS
REFUND OF OVERPAYMENT
APPLIED CONFISCATED COMMODS
APPLIED EXCEEDING BALANCE DUE
REFUND OF CONFISCATED COMMOD.
RETURNED CHECKS
MISC. ADJUSTMENTS

DEBITS

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
41	\$21,179.55	132	\$77,356.38	3,725	\$2,352,849.63
18	\$6,621.63-	89	\$19,701.63-	2,443	\$417,611.36-
15	\$3,838.22-	75	\$10,016.29-	1,693	\$204,550.51-
3	\$234.84	13	\$672.28	112	\$2,499.68
1	\$234.82	6	\$627.72	44	\$7,988.05
0	\$0.00	0	\$0.00	4	\$18,449.45-
0	\$0.00	0	\$0.00	4	\$10,601.49
0	\$0.00	0	\$0.00	18	\$78,254.09
0	\$0.00	0	\$0.00	1	\$36.75

DEBITS

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	0	\$0.00	2	\$35.00
0	\$0.00	0	\$0.00	13	\$10.22-

REASSESSMENTS

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	1	\$309.52	20	\$6,877.19
1	\$524.54-	3	\$2,289.52-	57	\$36,384.98-
0	\$0.00	0	\$0.00	207	\$138,113.64-
0	\$0.00	0	\$0.00	6	\$1,399.24-
0	\$0.00	0	\$0.00	0	\$4,279.59-
1	\$140.00-	2	\$44,940.60-	31	\$72,873.50-
0	\$0.00	0	\$0.00	0	\$0.00

CREDITS

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	1	\$309.52	20	\$6,877.19
1	\$524.54-	3	\$2,289.52-	57	\$36,384.98-
0	\$0.00	0	\$0.00	207	\$138,113.64-
0	\$0.00	0	\$0.00	6	\$1,399.24-
0	\$0.00	0	\$0.00	0	\$4,279.59-
1	\$140.00-	2	\$44,940.60-	31	\$72,873.50-
0	\$0.00	0	\$0.00	0	\$0.00

WRITE-OFFS

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	0	\$0.00	207	\$138,113.64-
0	\$0.00	0	\$0.00	6	\$1,399.24-
0	\$0.00	0	\$0.00	0	\$4,279.59-
1	\$140.00-	2	\$44,940.60-	31	\$72,873.50-
0	\$0.00	0	\$0.00	0	\$0.00

ASSESSMENTS WITHDRAWN

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	0	\$0.00	207	\$138,113.64-
0	\$0.00	0	\$0.00	6	\$1,399.24-
0	\$0.00	0	\$0.00	0	\$4,279.59-
1	\$140.00-	2	\$44,940.60-	31	\$72,873.50-
0	\$0.00	0	\$0.00	0	\$0.00

FOUND NOT RESPONSIBLE

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	0	\$0.00	207	\$138,113.64-
0	\$0.00	0	\$0.00	6	\$1,399.24-
0	\$0.00	0	\$0.00	0	\$4,279.59-
1	\$140.00-	2	\$44,940.60-	31	\$72,873.50-
0	\$0.00	0	\$0.00	0	\$0.00

CASES VOIDED BY ENFORCEMENT

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	0	\$0.00	207	\$138,113.64-
0	\$0.00	0	\$0.00	6	\$1,399.24-
0	\$0.00	0	\$0.00	0	\$4,279.59-
1	\$140.00-	2	\$44,940.60-	31	\$72,873.50-
0	\$0.00	0	\$0.00	0	\$0.00

FOOTNOTE:

** TOTAL OUTSTANDING 1,061 \$1,565,469.39

PAYMENTS FROM COLLECTION EFFORT
AMOUNT PAID TO COLLECTOR
FOREFEIT OF CONFISCATED COMMODS

# CASES	AMOUNT	# CASES	AMOUNT	# CASES	AMOUNT
0	\$0.00	4	\$100.00	62	\$11,194.67
0	\$0.00	1	\$25.00	3	\$2,798.66
0	\$0.00	1	\$0.00	3	\$3,202.60 *

1999		June			1999	
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

SCHEDULE FOR FINAL RULES TO BE PUBLISHED IN STATE REGISTER

FEB-99 RULE - Seismic Exploration

MAR-99 RULE - Shark Regulations

RULE - Harvest Regulations - Billfishes

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife & Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504) 765-2800

M.J. "Mike" Foster, Jr.
Governor

January 26, 1999

MEMORANDUM

To: Louisiana Wildlife and Fisheries Commission

From: Fred Kimmel, Upland Game Study Leader, Wildlife Division *FK*

Subject: Supplemented Hunting Preserves Declaration of Emergency

In your packet for the February LWFC meeting is a D.E. for Supplemented Hunting Preserves. This is the D.E. that established seasons and regulations for farm-raised white-tailed deer and exotics. The original D.E. that you promulgated in September expires on February 28th. In order to provide continuous regulation we need to pass another D.E. Dates and rules for hunting of farm-raised deer and exotics will be part of the 1999-2000 hunting season regulations which you will act upon in July. Once that occurs these periodic emergency rules will no longer be needed.

There are two minor changes from the September D.E.. The years for the hunting dates have been changed to reflect the upcoming hunting season (1999-2000). However, since this D.E. will expire prior to the hunting season and be supplanted by the permanent hunting regulations, these dates are not important except to show that the farm-raised white-tailed deer season is closed. We also made the language referencing DMAP noncommittal, because a new program that will allow either-sex harvest of farm-raised whitetails is being developed.

RESOLUTION
LOUISIANA WILDLIFE AND FISHERIES COMMISSION
LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES
February 4, 1999

The following was adopted by the Louisiana Wildlife and Fisheries Commission at its regular Commission Meeting held in Baton Rouge, LA, February 4, 1999.

- WHEREAS, The Louisiana Department of Agriculture and Forestry has been given certain authority to regulate farm-raised white-tailed deer, elk, exotic deer and antelope, raised for commercial purposes, and
- WHEREAS, the Louisiana Department of Agriculture and Forestry (LDAF) developed rules pertaining to farm-raised white-tailed deer, elk, exotic deer and antelope, and
- WHEREAS, these rules allowed for the raising, propagation, and hunting of imported exotic deer and antelope, elk, and farm-raised white-tailed deer within the confines of pens specified by LDAF rules and regulations,
- WHEREAS, a dispute arose over the regulation of hunting and the capture of wild white-tailed deer within LDAF licensed deer farms, and
- WHEREAS, the Louisiana Department of Wildlife and Fisheries and Louisiana Wildlife and Fisheries Commission filed a petition for a Temporary Restraining Order, Injunctive Relief, and Declaratory Judgement in the 19th JDC to resolve the disputed issues, and
- WHEREAS, a Stipulated Judgement was rendered in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th JDC, and
- WHEREAS, the Stipulated Judgement set terms for the regulation of hunting and
- WHEREAS, the authority to establish hunting seasons is vested with the Louisiana Wildlife and Fisheries Commission exclusively, and
- THEREFORE BE IT RESOLVED, that the Louisiana Wildlife and Fisheries Commission adopts the attached Declaration of Emergency to establish hunting seasons and regulations for white-tailed deer, elk, exotic deer and antelope on Supplemented Hunting Preserves.

Bill A. Busbice, Jr., Chairman
La. Wildlife and Fisheries Commission

James H. Jenkins, Jr., Secretary
La. Department of Wildlife and Fisheries

DECLARATION OF EMERGENCY

Department of Wildlife and Fisheries
Wildlife and Fisheries Commission

In accordance with the Emergency provisions of R.S. 49:953(B) of the Administrative Procedures Act, and under Authority of LSA Const. Art. IX, Sec. 7: LSA 36:601 et seq., 56:115, 56:171 et seq. and 56:651 et seq., the Louisiana Wildlife and Fisheries Commission adopts the following Emergency Rule.

This Declaration of Emergency is necessary to implement portions of the written stipulations entered into on August 10, 1998, in the matter entitled Jenkins et al. v. Odom et al., No. 449244, 19th Judicial District Court, and further to provide for regulation of hunting of white-tailed deer and exotics on Supplemented Hunting Preserves. This Declaration of Emergency will govern the regulation of hunting on Supplemented Hunting Preserves until the ratification of permanent rules.

**Supplemented Hunting Preserves: Hunting Seasons and Deer Management
Assistance Program Participation**

A. Definitions

Hunting: In its different tenses and for purposes of this rule means to take or attempt to take, in accordance with LSA 56:8.

Supplemented Hunting Preserve: For purposes of this rule means any enclosure for which a current Farm-Raising License has been issued by the Louisiana Department of Agriculture and Forestry (LDAF) with concurrence of the Louisiana Department of Wildlife and Fisheries (LDWF) and is authorized in writing by the LDAF and LDWF to permit hunting.

White-tailed Deer: For purposes of this rule means any animal of the species *Odocoileus*

virginianus which is confined on a Supplemented Hunting Preserve.

Exotics: For purposes of this rule means any animal of the family Bovidae (except the Tribe Bovini [cattle]) or Cervidae which is not indigenous to Louisiana and which is confined on a Supplemented Hunting Preserve. Exotics shall include, but are not limited to, fallow deer, red deer, elk, sika deer, axis deer, and black buck antelope.

Same as Outside: For purposes of this rule means hunting on a Supplemented Hunting Preserve must conform to applicable statutes and rules governing hunting and deer hunting, as provided for in Title 56 of the Louisiana Revised Statutes and as established annually by the Louisiana Wildlife and Fisheries Commission (LWFC).

B. Hunting Seasons

White-tailed Deer:

All hunting seasons for farm-raised white-tailed deer are still hunt only.

Archery: October 1, 1999 - January 31, 2000, either-sex

Modern Firearms: November 1 - December 6, 1999; December 21 - 23, 1999;

December 26, 1999 - January 31, 2000.

Either-sex deer may be taken November 1-3, December 21-23, and December 26-30,

otherwise, all modern firearm dates are bucks only. (Either-sex deer may also be taken in accordance with provisions of the Deer Management Assistance Program).

Muzzleloader: December 7 - December 20, 1999, either-sex.

Exotics: Year round

C. Methods of Take

White-tailed Deer: Same as outside

Exotics: Exotics may be taken with longbow (including compound bow) and arrow, shotguns not larger than 10 gauge, loaded with buckshot or rifled slug; handguns and rifles no smaller than 22 caliber centerfire; or muzzleloading rifles or pistols, 44 caliber minimum, or shotguns 10 gauge or smaller, all of which must load exclusively from the muzzle or cap and ball cylinder, using black powder or an approved substitute only, and using ball or bullet projectile, including sabot bullets only.

D. Shooting Hours

White-tailed Deer: Same as outside

Exotics: one-half hour before sunrise to one-half hour after sunset

E. Bag Limit

Farm-Raised White-tailed Deer: Same as outside

Exotics: No limit.

F. Hunting Licenses

White-tailed Deer: Same as outside

Exotics: No person shall hunt any exotic without possessing a valid basic and big game hunting license.

G. Tagging

White-tailed Deer and Exotics: Each animal shall be tagged in the left ear or left antler immediately upon being killed and before being moved from the site of the kill with a tag provided by the LDAF. The tag shall remain with the carcass at all times.

H. Deer Management Assistance Program

Supplemented Hunting Preserves may be eligible to participate in the Deer Management Assistance Program (DMAP) in accordance with the DMAP rules.

DRAFT

Not in Final Form

I. Additional Restrictions

Except as otherwise specified herein, all of the provisions of Title 56 of the Louisiana Revised Statutes and the LWFC rules pertaining to the hunting and possession of white-tailed deer shall apply to white-tailed deer and exotics located on Supplemented Hunting Preserves.

J. Effective Date

This Declaration of Emergency shall become effective on February 28, 1999, and supplant any prior Declaration of Emergency pertaining to hunting of farm-raised deer and exotics.

Bill A. Busbice, Jr.
Chairman

Louisiana Department of Wildlife and Fisheries

NEWS RELEASE

James H. Jenkins Jr.
Secretary



CONTACT
504/765-2923

99-31

2/2/99

AMENDED AGENDA FOR FEBRUARY COMMISSION MEETING

The Wildlife and Fisheries Commission will hold its next regular meeting on Thursday, Feb. 4, 1999 at 10 a.m. The meeting is open to the public and will take place in the Louisiana Room at Department of Wildlife and Fisheries headquarters, 2000 Quail Dr., Baton Rouge. The agenda follows.

1. Roll call
2. Approval of minutes of Jan. 7, 1999
3. Conservation Reinvestment Act resolution
4. Declaration of emergency — white-tailed deer and exotic game hunting regulations on supplemented hunting preserves
5. Presentation of 1999 profiles and stock assessments for sheepshead, southern flounder, striped mullet and black drum
6. Consideration of offshore shrimp closure
7. Declaration of emergency — oyster season in Bay Junop
8. Rule ratification — seismic regulations
9. Presentation of revised strategic plan
10. Update on point of sale contract
11. Enforcement and aviation reports/January
12. Warning citations discussion
13. Division reports
 - a. January 1999 waterfowl census, numbers and distribution
 - b. 1998-99 waterfowl hunting season results
 - c. Special snow goose hunting season regulations
14. Set June 1999 meeting date
15. Public comments
16. Adjournment

February 2, 1999

NEWS RELEASE

APPROVED: 

AMENDED AGENDA FOR COMMISSION MEETING

The next regular public board meeting has been scheduled by the Commission for 10:00 A.M. on Thursday, February 4, 1999, at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

1. Roll Call
2. Approval of Minutes of January 7, 1999
3. Conservation Reinvestment Act Resolution
4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves
5. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum
6. Consideration of Offshore Shrimp Closure
7. Declaration of Emergency - Oyster Season in Bay Junop
8. Rule Ratification - Seismic Regulations
9. Presentation of the Revised Strategic Plan
10. Update on Point of Sale Contract
11. Enforcement & Aviation Reports/January
12. Warning Citations Discussion
13. Division Reports
 - a. January 1999 Waterfowl Census, Numbers and Distribution
 - b. 1998-99 Waterfowl Hunting Season Results
 - c. Special Snow Goose Hunting Season Regulations
14. Set June 1999 Meeting Date
15. Public Comments
16. Adjournment

Louisiana Department of Wildlife and Fisheries

NEWS RELEASE

James H. Jenkins Jr.
Secretary



CONTACT
504/765-2923

99-29

2/1/99

AMENDED AGENDA FOR FEBRUARY COMMISSION MEETING

The Wildlife and Fisheries Commission will hold its next regular meeting on Thursday, Feb. 4, 1999 at 10 a.m. The meeting is open to the public and will take place in the Louisiana Room at Department of Wildlife and Fisheries headquarters, 2000 Quail Dr., Baton Rouge. The agenda follows.

1. Roll call
2. Approval of minutes of Jan. 7, 1999
3. Conservation Reinvestment Act resolution
4. Declaration of emergency — white-tailed deer and exotic game hunting regulations on supplemented hunting preserves
5. Notice of intent — box turtle harvest regulations
6. Presentation of 1999 profiles and stock assessments for sheepshead, southern flounder, striped mullet and black drum
7. Consideration of offshore shrimp closure
8. Declaration of emergency — oyster season in Bay Junop
9. Rule ratification — seismic regulations
10. Presentation of revised strategic plan
11. Update on point of sale contract
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13. Warning citations discussion
14. Division reports
 - a. January 1999 waterfowl census, numbers and distribution
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 - c. Special snow goose hunting season regulations
15. Set June 1999 meeting date
16. Public comments
17. Adjournment

February 1, 1999

NEWS RELEASE

APPROVED: 

AMENDED AGENDA FOR COMMISSION MEETING

The next regular public board meeting has been scheduled by the Commission for 10:00 A.M. on Thursday, February 4, 1999, at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

1. Roll Call
2. Approval of Minutes of January 7, 1999
3. Conservation Reinvestment Act Resolution
4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves
5. Notice of Intent - Box Turtle Harvest Regulations
6. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum
7. Consideration of Offshore Shrimp Closure
8. Declaration of Emergency - Oyster Season in Bay Junop
9. Rule Ratification - Seismic Regulations
10. Presentation of the Revised Strategic Plan
11. Update on Point of Sale Contract
12. Enforcement & Aviation Reports/January
13. Warning Citations Discussion
14. Division Reports
 - a. January, 1999 Waterfowl Census, Numbers and Distribution
 - b. 1998-99 Waterfowl Hunting Season Results
 - c. Special Snow Goose Hunting Season Regulations
15. Set June 1999 Meeting Date
16. Public Comments
17. Adjournment

Foote, Karen

From: Greeson, Cathy
Sent: Friday, January 29, 1999 3:51 PM
To: Foote, Karen
Subject: RE: For John

Karen, he has given his approval.

From: Foote, Karen
Sent: Friday, January 29, 1999 3:49 PM
To: Greeson, Cathy
Cc: Boudreaux, Claude; Schexnayder, Mark
Subject: For John

If you approve, I'll request that Susan add the following Commission agenda item ASAP:

Consideration of Offshore Shrimp Closure

This is what the item was entitled last year.

Louisiana Department of Wildlife and Fisheries

NEWS RELEASE

James H. Jenkins Jr.
Secretary



CONTACT
504/765-2923

99-24

1/26/99

AGENDA SET FOR FEBRUARY COMMISSION MEETING

The Wildlife and Fisheries Commission will hold its next regular meeting on Thursday, Feb. 4, 1999 at 10 a.m. The meeting is open to the public and will take place in the Louisiana Room at Department of Wildlife and Fisheries headquarters, 2000 Quail Dr., Baton Rouge. The agenda follows.

1. Roll call
2. Approval of minutes of Jan. 7, 1999
3. Conservation Reinvestment Act resolution
4. Declaration of emergency — white-tailed deer and exotic game hunting regulations on supplemented hunting preserves
5. Notice of intent — box turtle harvest regulations
6. Presentation of 1999 profiles and stock assessments for sheepshead, southern flounder, striped mullet and black drum
7. Declaration of emergency — oyster season in Bay Junop
8. Rule ratification — seismic regulations
9. Presentation of revised strategic plan
10. Update on point of sale contract
11. Enforcement and Aviation reports/January
12. Warning citations discussion
13. Division reports
 - a. January 1999 waterfowl census, numbers and distribution
 - b. 1998-99 waterfowl hunting season results

-over-

agenda/add-one.

c. Special snow goose hunting season regulations

14. Set June 1999 meeting date

15. Public comments

16. Adjournment

-30-

January 25, 1999

NEWS RELEASE

APPROVED: _____



AGENDA FOR COMMISSION MEETING

The next regular public board meeting has been scheduled by the Commission for 10:00 A.M. on Thursday, February 4, 1999, at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

1. Roll Call
2. Approval of Minutes of January 7, 1999
3. Conservation Reinvestment Act Resolution
4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves
5. Notice of Intent - Box Turtle Harvest Regulations
6. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum
7. Declaration of Emergency - Oyster Season in Bay Junop
8. Rule Ratification - Seismic Regulations
9. Presentation of the Revised Strategic Plan
10. Update on Point of Sale Contract
11. Enforcement & Aviation Reports/January
12. Warning Citations Discussion
13.
 - a. January 1999 Waterfowl Census, Numbers and Distribution
 - b. 1998-99 Waterfowl Hunting Season Results
 - c. Special Snow Goose Hunting Season Regulations
14. Set June 1999 Meeting Date
15. Public Comments
16. Adjournment

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

January 25, 1999

MEMORANDUM

TO: Chairman and Members of Commission
FROM: James H. Jenkins, Jr., Secretary
SUBJECT: February Commission Meeting Agenda

The next regular Commission meeting will be held at 10:00 A.M. on Thursday, February 4, 1999, in the Louisiana Room at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

The following items will be discussed:

1. Roll Call
2. Approval of Minutes of January 7, 1999

OFFICE OF WILDLIFE

3. Conservation Reinvestment Act Resolution
4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves
5. Notice of Intent - Box Turtle Harvest Regulations

OFFICE OF FISHERIES

6. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum
7. Declaration of Emergency - Oyster Season in Bay Junop
8. Rule Ratification - Seismic Regulations

Page 2
Commission Meeting
January 25, 1999

OFFICE OF MANAGEMENT & FINANCE

9. Presentation of the Revised Strategic Plan

CONFIDENTIAL ASSISTANT

10. Update on Point of Sale Contract

WINTON VIDRINE

11. Enforcement & Aviation Reports/January
12. Warning Citations Discussion

DIVISION REPORTS

13. a. January 1999 Waterfowl Census, Numbers and
Distribution
b. 1998-99 Waterfowl Hunting Season Results
c. Special Snow Goose Hunting Season Regulations
14. Set June 1999 Meeting Date
15. Public Comments

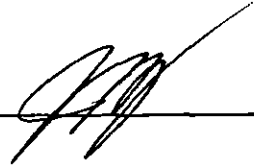
JHJ:sch

cc: Clyde Kimball
Jim Patton
Phil Bowman
John Roussel
Craig Lamendola
Don Puckett
Dennis Kropog
Division Chiefs

January 25, 1999

NEWS RELEASE

APPROVED: _____



AGENDA FOR COMMISSION MEETING

The next regular public board meeting has been scheduled by the Commission for 10:00 A.M. on Thursday, February 4, 1999, at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

1. Roll Call
2. Approval of Minutes of January 7, 1999
3. Conservation Reinvestment Act Resolution
4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves
5. Notice of Intent - Box Turtle Harvest Regulations
6. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum
7. Declaration of Emergency - Oyster Season in Bay Junop
8. Rule Ratification - Seismic Regulations
9. Presentation of the Revised Strategic Plan
10. Update on Point of Sale Contract
11. Enforcement & Aviation Reports/January
12. Warning Citations Discussion
13.
 - a. January 1999 Waterfowl Census, Numbers and Distribution
 - b. 1998-99 Waterfowl Hunting Season Results
 - c. Special Snow Goose Hunting Season Regulations
14. Set June 1999 Meeting Date
15. Public Comments
16. Adjournment

C O V E R

S H E E T



FAX

To: Bill Busbice

Fax #: 318-837-1423

Subject: Commission Agenda

Date: January 20, 1999

Pages: 3, including this cover sheet.

COMMENTS:

Please review the attached agenda and then give me a call. Bennie Fontenot stated you wanted a fish hatchery report, do you want this given at this meeting or did you just want a written report?

Thanks.

From the desk of...

Susan Hawkins

La. Dept. Of Wildlife & Fisheries
P. O. Box 98000
Baton Rouge, LA 70898-9000

225-765-2806
Fax: 225-765-0948

, 1999

MEMORANDUM

TO: Chairman and Members of Commission
FROM: James H. Jenkins, Jr., Secretary
SUBJECT: February Commission Meeting Agenda

The next regular Commission meeting will be held at **10:00 A.M. on Thursday, February 4, 1998**, in the Louisiana Room at the Wildlife and Fisheries Building, 2000 Quail Drive, Baton Rouge, LA.

The following items will be discussed:

1. Roll Call
2. Approval of Minutes of January 7, 1999
3. Conservation Reinvestment Act Resolution

OFFICE OF WILDLIFE

4. Declaration of Emergency - White-Tailed Deer & Exotic Game Hunting Regulations on Supplemented Hunting Preserves
5. Notice of Intent - Box Turtle Harvest Regulations

OFFICE OF FISHERIES

6. Presentation of 1999 Profiles and Stock Assessments for Sheepshead, Southern Flounder, Striped Mullet and Black Drum
7. Declaration of Emergency - Oyster Season in Bay Junop
8. Rule Ratification - Seismic Regulations

Page 2
Commission Meeting
, 1999

OFFICE OF MANAGEMENT & FINANCE

9. Presentation of the Revised Strategic Plan

CONFIDENTIAL ASSISTANT

10. Update on Point of Sale Contract

WINTON VIDRINE

11. Enforcement & Aviation Reports/January
12. Warning Citations Discussion

DIVISION REPORTS

13. a. January 1999 Waterfowl Census, Numbers and Distribution
b. 1998-99 Waterfowl Hunting Season Results
c. Special Snow Hunting Season Regulations
14. Set June 1999 Meeting Date
15. Public Comments

JHJ:sch

cc: Clyde Kimball
Jim Patton
Phil Bowman
John Roussel
Craig Lamendola
Don Puckett
Dennis Kropog
Division Chiefs

Hawkins, Susan

From: Lamendola, Craig
Sent: Wednesday, January 20, 1999 8:34 AM
To: Hawkins, Susan
Cc: Jenkins, James
Subject: Agenda: POS K

Susan

If its not too late, put me on the Feb. agenda to tell the Commission about the auto-license contract, etc.

Tx

CL

~~Resolution -~~

Conservation

Reinvestment

Act Resolution -

Phil Bowman

1:40 PM

Susan

Claude

ing

Black Drum

assments for Sheepshead, Southern Flounder, Striped Mullet and

Oyster Season- Bay Junop - DOE

Final Rule: Seismic Regulations

Hawkins, Susan

From: Bateman, Hugh
Sent: Tuesday, January 19, 1999 1:05 PM
To: Hawkins, Susan
Cc: Bowman, Philip; Prickett, Tommy; Olinde, Mike; Helm, Robert; Myers, Randy; Moreland, Dave
Subject: Feb. 4, '99, Comm. Agenda Items , Wildlife Division

1- Renewal of Declaration of Emergency - White-tailed Deer and Exotic Game Hunting Regulations on Supplemented Hunting Preserves, Dave Moreland

2- Division Reports: (A) January '99 Waterfowl Census , Numbers and Distribution, Randy Myers
(B) 1998-99 Waterfowl Hunting Season Results, Robert Helm.
(C) Special Snow Hunting Season Regulations, Robert Helm

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

January 5, 1999

MEMORANDUM

TO: Deputy Secretary, Undersecretary, Assistant Secretary-
Office of Wildlife, Assistant Secretary-Office of
Fisheries and Confidential Assistant

FROM: James H. Jenkins, Jr. Secretary

SUBJECT: Commission Meeting Agenda - February 4, 1999

Please write on the bottom of this memo and return to Susan Hawkins by Tuesday, January 19th any agenda items your office may have for the Thursday, February 4th Commission Meeting to be held in Baton Rouge, Louisiana, at the Wildlife and Fisheries Building, 2000 Quail Drive. This meeting will begin at 10:00 a.m. on February 4th. If you do not have anything for the agenda, please return memo and indicate so on the bottom of this memo. We cannot add anything to the agenda that requires commission action after we have published the agenda in the state journal.

Resolutions and Notices of Intent should be included with the list of items to be placed on the agenda. Thank you for your cooperation!

JHJ/sch

cc: Commissioners
Don Puckett
Winton Vidrine
Hugh Bateman
Bennie Fontenot
Karen Foote
Wynnette Kees
Lyle Soniat
Brandt Savoie

Enf. Report
WARNING CITATIONS
W.V.

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

January 5, 1999

MEMORANDUM

TO: Deputy Secretary, Undersecretary, Assistant Secretary-
Office of Wildlife, Assistant Secretary-Office of
Fisheries and Confidential Assistant

FROM: James H. Jenkins, Jr. *[Signature]* Secretary

SUBJECT: Commission Meeting Agenda - February 4, 1999

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cc: Commissioners
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Wynnette Kees
Lyle Soniat
Brandt Savoie

Dear Susan:

I have no agenda items "per se". However Comm. Suspice may want ^{for} on the agenda an update on Cooper Fowler Fish Hatchery. I will be out of state on leave until Tuesday, Jan - 19. In the meantime could you check with Mr. Suspice and add it to the agenda if he so request. Thanks.

An Equal Opportunity Employer

Bennie

Hawkins, Susan

From: Kees, Wynnette
Sent: Wednesday, January 13, 1999 8:22 AM
To: Hawkins, Susan
Subject: RE: Feb commission agenda

Yes - that would be great - I'll send you 8 copies. thanks.

From: Hawkins, Susan
Sent: Wednesday, January 13, 1999 8:19 AM
To: Kees, Wynnette
Subject: RE: Feb commission agenda

Mr. Patton had already told me of the agenda item. If you want me to, I can mail out the copies of the Plan when I send out the other agenda information. Just let me know.

Susan

From: Kees, Wynnette
Sent: Wednesday, January 13, 1999 8:17 AM
To: Hawkins, Susan
Subject: Feb commission agenda

Please add to agenda: "adoption of revised strategic plan"

Mr. Patton has talked with the chairman about this and all members will be sent a copy of the plan before the meeting.

Hawkins, Susan

From: Patton, James
Sent: Tuesday, January 12, 1999 11:24 AM
To: Hawkins, Susan
Subject: February Commission Agenda

Susan: Did you get my note requesting that we place the presentation of the revised Strategic Plan on the Feb. agenda? ->JLP

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

January 5, 1999

MEMORANDUM

TO: Deputy Secretary, Undersecretary, Assistant Secretary-
Office of Wildlife, Assistant Secretary-Office of
Fisheries and Confidential Assistant

FROM: James H. Jenkins, Jr. Secretary

SUBJECT: Commission Meeting Agenda - February 4, 1999

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cc: Commissioners
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Brandt Savoie

PLEASE ADD
PRESENTATION OF THE REVISED
STRATEGIC PLAN

A handwritten signature, likely of the Secretary, James H. Jenkins, Jr.

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

January 5, 1999

MEMORANDUM

TO: Deputy Secretary, Undersecretary, Assistant Secretary-
Office of Wildlife, Assistant Secretary-Office of
Fisheries and Confidential Assistant

FROM: James H. Jenkins, Jr. *[Signature]* Secretary

SUBJECT: Commission Meeting Agenda - February 4, 1999

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Hugh Bateman
Bennie Fontenot
Karen Foote
Wynnette Kees
Lyle Soniat
✓ Brandt Savoie

None
[Signature]

REC'D

JAN 07 98

FUR & REFUGE
BATON ROUGE

State of Louisiana



James H. Jenkins, Jr.
Secretary

Department of Wildlife and Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(504)765-2800

M.J. "Mike" Foster, Jr.
Governor

January 5, 1999

MEMORANDUM

TO: Deputy Secretary, Undersecretary, Assistant Secretary-
Office of Wildlife, Assistant Secretary-Office of
Fisheries and Confidential Assistant

FROM: James H. Jenkins, Jr. *[Signature]* Secretary

SUBJECT: Commission Meeting Agenda - **February 4, 1999**

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